Section 3
Project Description

During the 1995-1996 field investigation, soil investigations were conducted in 12 areas (designated Area 1 through Area 12) of the facility. The 1997 field investigation included additional soil investigations in Area 5, Area 7, and Area 11 plus soil investigations in two newly identified areas designated Area 13 and Area 14. The locations of these areas are illustrated on Plate 2. The designations assigned to these areas are as follows:

- Area 1 Old Northwest Pot Dump and Associated Areas
- Area 2 Former Potliner Loadout Area
- Area 3 Former Potliner Management Areas
- Area 4 Potliner Breakout and Accumulation Buildings
- Area 5 Former Anode Burnoff Pile, Railcar Loadout Building, and Tank Farm
- Area 6 Oil Recovery Ponds
- Area 7 Outfall 001 Conveyance
- Area 8 Sprayfield
- Area 9 Neutralization Tank
- Area 10 Background Areas
- Area 11 Tank 1
- Area 12 Industrial Landfill and Sprayfield Storm Water Drainage Area
- Area 13 Solid Pitch Unloading and Carbon Plant Storage Drainage Area
- Area 14 Subsurface Debris Area

Areas 1 through Area 9 and Areas 11 through 14 were identified in the Consent Order or DCC Report as being possible areas of releases. Soil investigations conducted in these areas are presented in Section 4 through Section 16 of this report. Soil samples were also collected from Area 10, the Background Areas, during the 1995-1996 RFI. Background sample collection and analysis are discussed in Subsection 3.1.3.

Groundwater quality was investigated in three areas of the site during the 1995-1996 RFI: the Industrial Landfill, Sprayfield, and Old Landfill. Groundwater quality in the vicinity of Interceptor Basin 002 and Interceptor Basin 004 was investigated during the 1997 RFI. The extent and thickness of floating oil in wells installed in the vicinity of the Oil Recovery Ponds were evaluated during both RFIs. A discussion of the occurrence of cyanide in groundwater,

based on data collected for other regulatory programs plus supplemental data collected during the 1997 RFI, is also included in this report. The locations of the groundwater montioring areas are illustrated on Plate 3. Two of these areas, the Sprayfield and Oil Recovery Ponds, were also the subject of soil investigations. The groundwater quality and floating oil investigations conducted in these areas are included with the corresponding soil investigation discussion in the report sections designated above. Groundwater quality investigations conducted at the Old Landfill, Industrial Landfill, and Interceptor Basins are presented in Sections 17, 18, and 19 of this report.

The Industrial Landfill, Sprayfield, and Oil Recovery Ponds have been the subject of previous studies, investigations, and quarterly groundwater monitoring. The groundwater quality and oil thickness data generated by the RFI have been evaluated in conjunction with the results of previous and ongoing studies to assess the current status and historical trends of groundwater quality and floating oil levels in these areas.

Five monitoring wells and one piezometer were installed as part of the 1995-1996 RFI activities to aid in the evaluation of groundwater conditions. Two monitoring wells were installed as part of the 1997 RFI activities. The location of the newly installed wells, designated MW-5, MW-6, MW-7, MW-8s, MW-8d, MW-9, and MW-1R, the newly installed piezometer, designated PZ-1, and other wells sampled or monitored for the RFI are illustrated on Plate 3.

The scope of work performed during the RFI was intended to re-evaluate the results of previous investigations and/or further characterize the type and extent of hazardous constituents present in soil and groundwater. Soil and groundwater samples collected for the RFI were analyzed for a range of parameters, including total cyanide, weak acid dissociable cyanide, free cyanide by the microdiffusion method, RCRA metals, Appendix IX VOCs and SVOCs, PCBs, pH, total suspended solids (TSS), oil & grease, and total petroleum hydrocarbons (special range organics). A complete listing of the target parameters is provided on Table 3-1. The target parameters selected for each area were based on the current and past materials stored and handled in each area, on findings of previous sampling investigations, and on agreements reached in conversations held with USEPA. RMT Laboratories of Madison, Wisconsin, analyzed samples collected during the 1995-1996 RFI for Appendix IX VOCs, RCRA metals, and TSS. Kemron Environmental Services of Marietta, Ohio, (Kemron) analyzed samples collected during the 1995-1996 RFI for total cyanide, weak acid dissociable cyanide, Appendix IX SVOCs, PCBs, pH, and oil & grease analyses. Kemron performed all analytical services for the 1997 RFI.

3.1 Sampling Methodology

Surface soil, subsurface soil, sediment, and groundwater samples were collected from the facility as part of the RFI. Field screening methods were used to aid in the selection of samples for volatile organic analyses. These methods are detailed in this Section.

3.1.1 Soil Sampling and Field Screening Methods

Surface soil samples were collected using stainless steel scoops. Depending on the conditions at each sampling location, subsurface soil and sediment samples were collected using 2-inch or 3-inch diameter split barrel samplers, 4-inch diameter continuous core samplers, or a hand auger. Drilling activities were conducted using ATV or portable skid rigs equipped with hollow stem augers. Soil and debris samples in Area 14 were collected from the sidewalls of exploratory trenches using a hand auger. Sampling equipment was decontaminated in accordance with the methodology described in Subsection 5.7 of the approved RFI Workplan, except that a dilute hydrochloric acid rinse was added to the procedure (Malcolm Pirnie, 1995; RMT 1995). In borings where VOCs were to be analyzed, a portion of the sample was removed directly from the sampler using stainless steel scoops or spatulas and placed in appropriate sample containers. The remainder of the sample was placed in a stainless steel bowl and covered with aluminum foil. After a minimum of 15 minutes, the probe of a portable photoionization detector (PID) was inserted through the foil, and a VOC headspace measurement was recorded.

For borings in which Appendix IX VOCs and SVOCs were to be analyzed, the PID measurements and borehole geology were used to select a sample interval for analysis. If VOCs were detected during the headspace screening, the interval displaying the highest headspace PID reading was chosen. This method was intended to select the interval within the boring containing the highest concentration of VOCs. Thus, the VOC results presented in this report represent high-end rather then average concentrations. If no samples had headspace readings above background levels, the geology of the borehole was evaluated to determine if a fine-grained unit, such as a clay, was present that would tend to inhibit downward movement of a substance released at the surface. If such a unit was present, the sample interval collected immediately above this unit was selected for the Appendix IX analysis. If such a unit was not identified, the 3-foot to 5-foot sample interval was selected for these analyses.

Soil samples collected from each boring were visually classified according to the Unified Soil Classification System. Logs of each of the borings are provided in Appendix B.

3.1.2 Groundwater Sampling Methods

Groundwater samples were collected using submersible pumps and decontaminated bottom-filling bailers. The submersible pumps were used for low disturbance purging of the wells. After pumping the required volume of water for purging, samples for metals and cyanide were collected using the pump and Teflon tube purging system. The pump was removed and a Teflon bailer was slowly lowered into the well for the collection of VOC and SVOC samples. During the 1995/96 RFI, some groundwater samples were collected using only bailers. This resulted in elevated turbidity in the wells and elevated total metals concentrations in the samples. During the 1997 RFI, samples for metals analysis were collected using the low disturbance purging method.

Groundwater sampling equipment was decontaminated in accordance with the methodology described in Subsection 5.7 of the approved RFI Workplan (Malcolm Pirnie, 1995; RMT 1995). Both filtered and unfiltered groundwater samples were collected for metals analyses. Filtering was performed in the field in accordance with the methods described in Subsection 5.2.4 of the approved RFI Workplan.

Prior to collecting groundwater samples, three total well volumes were removed from each well. Four field parameters, specific conductance, pH, temperature, and turbidity, were monitored following removal of each well volume of water during purging. The field parameter measurements for the final two consecutive samples were monitored to ensure a variance of not more than 10 percent. Table 3-2 provides a summary of field parameters monitored during sampling. All field instrumentation was calibrated daily according to the procedures described in the approved Workplan (Malcolm Pirnie, 1995; RMT, 1995).

3.1.3 Collection and Analysis of Background Soil Samples

The metals that were investigated as part of the RFI also occur naturally in the soils and bedrock of the facility and surrounding area. Background samples were collected and analyzed to provide information on the range of concentrations of these naturally occurring elements that could be expected in soil samples collected for the RFI. Background sampling locations were selected based on a review of the site operational history; thus, areas of the site that would most accurately represent background conditions were selected. Additional consideration was given to the geology of the site. Review of boring logs from previous site investigations indicated two major divisions in the lithology of the unconsolidated materials at the site: one consisting primarily of clayey-silts to clayey-sands, and the other consisting primarily of sand and gravel mixtures. Furthermore, the site is developed on three different river terraces; the upper, middle, and bottom terraces.

Background soil samples were collected to represent each of the three river terraces and both major divisions in lithology. Eight background soil samples were collected from four boring locations designated SB-1001 through SB-1004 on Figure 3-1. Boring SB-1001 was located approximately 100 feet northeast of a cemetery on the middle terrace. Boring SB-1002 was located on the floodplain of the Ohio River on the lower terrace. Boring SB-1003 was located in a wooded area on the upper terrace east of the closed Industrial Landfill. Boring SB-1004 was located on the floodplain south of the Sprayfield, along the tree line on the lower terrace. Two soil samples were collected from each boring; one representing each lithologic division.

The eight background soil samples collected for the RFI were analyzed for RCRA metals. As requested by USEPA, each of the background samples was also analyzed for Appendix IX VOCs and SVOCs to confirm that the sampling locations represented background conditions. As described in Subsection 3.1.1, samples were field screened using a portable PID. Summaries of the background samples field screening results are provided in Appendix J. The background sample laboratory analyses results are provided in Appendix F.

The results of the RFI soil metal analyses were compared to published regional soil metal data obtained from Boerngen and Shacklette (1981). The range of elemental soil metal concentrations observed across Ohio and West Virginia, as well as the range of metal concentrations detected in the RFI background samples, are provided on Table 3-3. This table demonstrates that the range in metal concentrations observed in the eight RFI background soil samples are generally within or somewhat less than the range of those observed regionally.

Data from one background soil sample were included in the 1988 Versar RFA Report. According to the RFA Report, Versar, Inc. (Versar), collected one background soil sample from a location near production well F-9. The results of the analyses performed on the background sample are included on Table 3-4. Again, the ranges of soil metal concentrations observed in the eight RFI background soil samples are comparable to the concentrations observed in Versar's background sample.

Trace levels of three VOCs and two SVOCs met data validation criteria in the RFI background soil samples. Acetone, 2-butanone, and tetrachloroethene were reported in soil samples collected from borings SB-1003 and SB-1004. Bis(2-ethylhexyl)phthalate and di-n-octylphthalate were detected in samples collected from each of the borings. With the exception of acetone, each of the reported VOCs and SVOCs were qualified as estimated values or values less than the reporting limit. The levels of acetone detected in samples from borings SB-1003 and SB-1004 (0.19 mg/kg to 0.22 mg/kg) were only

slightly above the validation limits established during the data validation process (0.16 mg/kg to 0.21 mg/kg). Acetone and bis(2-ethylhexyl)phthalate (BEHP) were also detected in Versar's background soil sample. Upon review of the RFA Report, it was not clear whether or not Versar analyzed their background sample for 2-butanone, tetrachloroethene, or di-n-octylphthalate.

The presence of the reported VOCs and SVOCs in the background samples does not affect their utility in providing background soil metal data. Because phthalates are widely used as plasticizers and are frequently detected in background samples, their presence may be attributable to sample handling. The metal concentrations in the samples in which very low concentrations of VOCs and SVOCs were detected were well within the ranges established by samples in which VOCs and SVOCs were not detected. Furthermore, comparison of the metals values from the RFI background samples with the published regional values and the Versar sample results indicates that the background samples are representative of the concentrations of naturally occurring metals present at the CAWV facility.

PAHs were not detected in background samples collected at the site. However, PAHs are commonly detected in urban and industrial areas not directly affected by any specific industrial process. In remote areas, total PAH concentrations of 0.2 mg/kg have been detected, while concentrations of 4 mg/kg to 8 mg/kg have been detected in samples collected near a busy highway. PAH concentrations as high as 130 mg/kg have been detected in ordinary road dust (US DHHS, 1993). Thus, PAHs are expected to be present in samples collected at any industrial or urban site.

3.1.4 Collection of Quality Control Samples

Field blanks, trip blanks, rinsate blanks, method blanks, field and laboratory duplicates, standard reference materials (SRM), and matrix spike samples were analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Field blank samples were collected at a frequency of 1 for every 20 or fewer investigative samples. Rinsate blank samples were collected at a frequency of 1 per week of field activity. Trip blanks were submitted with each shipment of aqueous VOC samples sent to the laboratory. One field duplicate was collected for every 20 or fewer investigative samples per matrix.

Method blank samples are generated within the laboratory. Matrix spike (MS) samples for organic compounds are performed in duplicate and are hereinafter referred to as MS/MSD samples. Soil MS/MSD samples require no extra volume; however, extra

aqueous samples were collected from selected wells for these analyses. One MS/MSD was collected/designated for every 20 or fewer investigative samples per matrix. MS analyses for inorganic compounds were performed at a frequency of 1 for every 20 investigative samples per sample matrix.

QC samples were used in the data validation process to assess the quality of the data resulting from the field sampling and analytical programs.

3.2 Data Evaluation Methods

The following methods were used to evaluate the data collected during the RFI.

3.2.1 Data Validation

Laboratory data were validated using relevant portions of USEPA's Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review (1991); Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (1988); Region III Modifications to National Functional Guidelines for Organic Data Review - Multi-Media, Multi-Concentration (1994); Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (1993). Experienced data validators who are independent of the laboratory validated the data.

The data validation process consisted of reviewing the following: sample hold times, blank results, surrogate and matrix spike recoveries, laboratory and field duplicates, initial and continuing instrument calibration, and laboratory control samples. Noted discrepancies and omissions in the data packages were remedied by contacting laboratory staff for clarification, correction, or addition, as appropriate. Data validation notes are provided in Appendix C.

Data qualifiers added by the laboratory are capital letters as follows:

B (organic)	Present in analytical method blank
D, DL	Results from diluted sample
E	Concentration exceeds instrument calibration range
I	Estimated concentration due to severe matrix interferences
J	Estimated concentration
P	Greater than 25 percent difference in detected concentrations between the two GC columns

Q Qualitative mass spectral evidence of analyte present; concentration is less than reporting limit

Where data did not conform to the validation guidelines, the data validators added appropriate qualifiers. Data qualifiers added by the data validators are lower case letters as follows:

u Detection of analyte was not validated. The specific reason for not validating the result is given in the data validation notes included as Appendix C; however, the most common situation is the occurrence of the analyte at similar concentrations in an associated blank.

j Estimated concentration. The reported concentration is considered to be an estimate because of associated QC data.

r Data is unusable. This is typically a result of a sample matrix effect and not a laboratory performance issue.

The guidance documents noted at the beginning of this section were used to determine which reported detections of analytes were invalidated because of similar concentrations in associated blanks. Each data summary table presented in the text of this report includes only those constituents that had at least one validated detection in the data set summarized in the table.

3.2.2 Preliminary Risk-Based Screening

USEPA Region III policy requires all RFI data to first be screened against conservative preliminary screening levels to assess the completeness of the investigation. The results of conservative preliminary screening are provided in Appendix D. Preliminary Screening Levels for soil samples collected during the RFI were obtained from two primary sources: *USEPA Region III RBC Table* (Jennifer Hubbard, October 1, 1998), and *Soil Screening Guidance, Technical Background Document* (USEPA Office of Solid Waste and Emergency Response, May 1996). Preliminary Screening Levels for groundwater samples are Groundwater Standards taken from the West Virginia Groundwater Standards, where available, or MCLs or non-zero Maximum Contaminant Level Goals (MCLGs) taken from the Federal Safe Drinking Water Act, or tap water values from the USEPA Region III RBC Table (October 1, 1998).

The USEPA Region III RBC Table provides direct contact risk levels based on soil ingestion for residential and industrial land use scenarios. In accordance with Region III policy, the soil values provided under the residential land use column were used for conservative preliminary screening. Four constituents were detected in site soil

samples for which a value was not available on the RBC Table. Conservative preliminary screening levels for three of these compounds were based on analogous compounds. Appropriate analogous compounds were determined from Appendix X, Table A in the proposed Hazardous Waste Identification Rule [60 FR 66445]. In that proposed rule, USEPA established exit criteria for acenaphthylene and phenanthrene equivalent to the criteria for anthracene. Likewise, the proposed exit level for benzo(g,h,i)perylene is equivalent to the level for benzo(k)fluoranthene. Therefore, the preliminary screening levels for acenaphthylene and phenanthrene is the anthracene value on the RBC Table and the preliminary screening level for benzo(g,h,i)perylene is the benzo(k)fluoranthene value of the RBC Table. The fourth compound, diallate, was formerly included on the RBC Table. Its screening level is the residential soil value from the October 1997 RBC Table.

The concentrations presented in the RBC Table were calculated based on a HI of 1 for noncarcinogens and a lifetime cancer risk of 10^{-6} for potential carcinogens. USEPA Region III policy requires preliminary screening to be based on an HI of 0.1. This requirement is based on the general possibility of multiple hazardous constituents and multiple exposure pathways at a site. The screening values used for this RFI are based on an HI of 0.1.

Soil Screening Guidance - Technical Background Document provided preliminary screening levels for potential migration of constituents from soil to groundwater. Generic SSLs listed in Appendix A of the Soil Screening Guidance Document based on a dilution-attenuation factor (DAF) of 20 were used for preliminary screening. Preliminary screening levels for potential migration to groundwater for constituents for which there are no published SSLs were calculated using the equations presented in the soil screening guidance document.

SSLs are based on several conservative assumptions, such as an infinite source of constituents of concern, a uniform distribution of the constituent from ground surface to the water table with all adsorption sites in the unsaturated zone filled, no chemical or biological degradation in the unsaturated zone, and instantaneous and linear soil/water partitioning. The DAF of 20 provides for some dilution in the aquifer, but actual dilution is likely much higher due to hydrogeological conditions at the site. Therefore, SSL screening provides only an indication that a constituent might have the potential to migrate vertically through the unsaturated zone to underlying groundwater. When an SSL was exceeded in preliminary screening, other factors about the area, such as the applicability of the assumptions used to derive the SSL value, were evaluated to assess the actual potential for environmentally significant migration of the constituent.

There are two exceptions to the development of CPSLs from the RBC Table: arsenic and lead. The development of an appropriate preliminary screening level for arsenic requires additional consideration of arsenic-specific toxicological characteristics. It is important to note that USEPA has a special risk management policy for arsenic (USEPA, 1993) that recognizes that arsenic-related cancer risks of up to 10^{-3} are acceptable. This modified target risk is appropriate since the arsenic-related cancers are squamous cell carcinomas with a low mortality rate. In the development of preliminary screening level for arsenic, a conservative and protective cancer risk of 10^{-5} was used.

USEPA has no reference dose or potency slope factor for inorganic lead, so there is no risk-based concentration for lead on the RBC Table. However, as referenced in the October 1, 1998, cover memorandum for the RBC Table, "The USEPA Office of Solid Waste has released a detailed directive on risk assessment and cleanup of residential soil lead. The directive recommends that soil lead levels less than 400 ppm be considered safe for residential use." Therefore, 400 mg/kg was selected as the preliminary screening level for lead in soil samples collected for the RFI.

The conservative preliminary screening level for total cyanide in site samples was based on the toxicity of free cyanide. The toxicity of cyanide varies significantly with its chemical form and is related to the concentration of free cyanides ($HCN + CN^-$) in equilibrium with the cyanide salts (simple or complexed). This equilibrium is affected by pH and the stability constants of the cyanide salts (Hartung, 1990). Studies have been conducted at this site and at other spent potliner sites to assess the forms of cyanide present. Cyanide concentrations in potliner-related samples have ranged from 3 percent to 18 percent free cyanide. The remaining cyanide is predominantly iron-complexed, although small amounts of simple salts are also present. Based on animal studies, ferrocyanide complexes have been estimated to be 200 to 300 times less toxic than free cyanide (Hartung, 1990). They also have a high stability factor. Therefore, the preliminary screening level for cyanide is very conservative.

Chromium can be present in the environment as chromium III (trivalent) or chromium VI (hexavalent). In most soils, chromium will be present in the chromium III state (ASTDR, 1998). Chromium III is immobilized in the environment due to adsorption and complexation with soil materials and does not oxidize to chromium VI. However, chromium VI is reduced to chromium III in the presence of organic matter or in deeper soil in the presence of S^{-2} and Fe^{+2}. Preliminary and industrial screening were conducted based on screening levels for hexavalent chromium, the more toxic and more mobile form of chromium. Therefore, screening was very conservative.

Preliminary screening for groundwater samples was based on the West Virginia groundwater quality standards, federal primary drinking water standards (MCLs), and Region III RBC for tap water. For parameters for which a West Virginia groundwater standard was not available, federal primary drinking water standards were used. If federal MCLs were also not available, the USEPA Region III RBCs for tap water were used. For noncarcinogenic parameters, the level listed in the RBC Table for Tap Water was multiplied by 0.1 in accordance with USEPA Region III policy for preliminary screening. Tables comparing RFI results to preliminary screening levels are provided in Appendix D.

3.2.3 Industrial Health -Based Screening for Soil

The data were screened against industrial health-based screening levels to assess the potential for soils in an area to present a risk to human health under the current and reasonably anticipated future land use of the site. Health-based screening levels for soil at an industrial land use site were obtained from the Region III RBC Table for industrial exposure to soil. Except for cyanide and PCBs, the same explanations and exceptions detailed in Subsection 3.2.2 apply to the generic industrial screening levels. The industrial screening levels used in this report are summarized in Table 3-5.

As stated in Subsection 3.2.2, the conservative preliminary screening level for cyanide is based on free cyanide, whereas the cyanide present at the site is most likely predominantly in the form of ferrocyanide complexes as discussed below. The toxicity of cyanide varies significantly with its chemical form. The RBC Table includes toxicity values for free cyanide, several simple cyanide salts, and one complexed cyanide salt. Cyanide may be present in the environment in any or all of these forms. The toxicities of the various cyanides are related to the concentration of free cyanides ($HCN + CN^-$) in equilibrium with the cyanide salts (simple or complexed). This equilibrium is affected by pH and the stability constants of the cyanide salts (Hartung, 1990).

Soil analyses conducted during the RFI were for total cyanide. Other studies have been conducted at this site and at other spent potliner sites to assess the forms of cyanide present. KACC conducted tests in 1976 on samples of Pot Lining Slab Liquor (slab liquor) and Pot Soaking Pit Liquor (pit liquor). The slab liquor sample had a free cyanide concentration that was 18 percent of the total cyanide concentration. The pit liquor sample had a free cyanide concentration that was 13 percent of the total cyanide concentration (KACC, 1979). A recent study of cyanide in Outfall 001, the blocking wells, DM-1, and DM-4 indicated that approximately 3 to 10 percent of total cyanides in the groundwater are weak acid dissociable (KACC, 1996). Other studies have found free cyanide in spent potliner to be 3 to 5 percent of total cyanide (Goldman, 1996). In

1977, KACC used infrared spectroscopy, X-ray diffraction, and chemical analysis techniques to assess the forms of cyanide in pit liquor. The predominant form of cyanide in the pit liquor residue was sodium ferrocyanide. A trace of potassium cyanide was also detected. Photometric chemical analysis of the pit liquor residue confirmed earlier findings: free cyanide was about 13 percent of total cyanide and the remainder of the cyanide was in the form of ferrocyanide (KACC, 1979).

Ferrocyanides, while soluble, have high stability constants. Therefore, they do not dissociate easily to free cyanide even at low pH levels. Based on animal studies, ferrocyanide complexes have been estimated to be 200 to 300 times less toxic than free cyanide (Hartung, 1990). Ferrocyanide complexes are not included in the RBC Table from which the preliminary screening levels are derived. Since the toxicity of cyanide is related to its stability constant, the stability constant of ferrocyanide (35.4) was compared to the stability constants of cyanide compounds listed on the RBC Table. The closest stability constant is for potassium silver cyanide (20.5). Potassium silver cyanide has an RBC industrial soil ingestion concentration of 41,000 mg/kg at a HI of 0.1. Therefore, the RBC for potassium silver cyanide was selected for use in the RFI as an approximation of the potential health effects of total cyanides detected in site soils during the RFI. Potassium silver cyanide does not have an SSL.

PCBs are regulated under the Toxic Substances Control Act (TSCA). TSCA regulations include health-based cleanup standards for restricted access areas with PCB-affected soils. The TSCA cleanup standards are used in this report as a screening value for industrial land use.

3.2.4 RFI Data Evaluation

Soil and groundwater samples collected for the RFI were evaluated to 1) determine if there is evidence of a release of hazardous constituents; and 2) determine if the released constituent potentially poses a significant risk to human health and the environment.

Summary tables provide the concentrations of constituents detected and validated in one or more samples collected from the area summarized on that table. Concentrations of constituents that exceed the generic industrial screening levels or migration to groundwater screening levels are highlighted.

Two laboratories were used to perform analyses on samples collected for the RFI. RMT laboratories assigned J qualifiers to indicate that the reported value is an estimate. Kemron assigned Q qualifiers to indicate estimated values. To avoid apparent

redundancy on the data summary tables, J qualifiers are used to indicate estimated concentrations reported by both laboratories.

Soil Samples

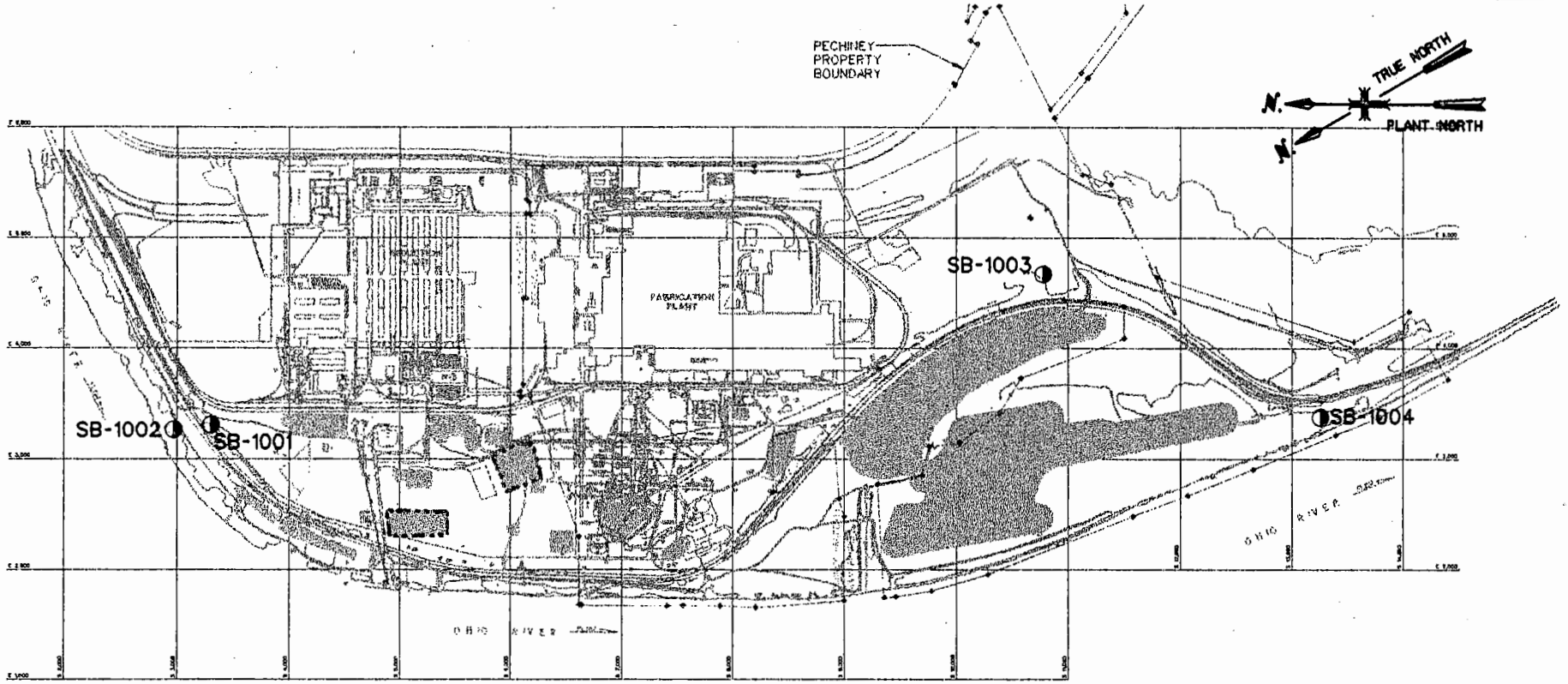
Metals in soil samples were evaluated by comparing detected concentrations to a value of twice the mean of the RFI background samples. Twice the mean of the background range was used as the RFI site background value to account for typical variation of naturally occurring metals, consistent with USEPA Region IV Supplemental Guidance to Risk Assessment Guidance for Superfund (RAGS) (USEPA Region IV, October 1996). This value is provided in the "Site Background" column of the summary tables. Metals that were found to exceed the site background value were considered to be potentially elevated due to site activities. The elevated metal concentrations were then compared to their respective GISLs and migration to groundwater screening levels (SSLs) to assess whether concentrations are sufficiently elevated to present a potential risk to human health or the environment. Screening levels are discussed in Subsection 3.2.2 and Subsection 3.2.3.

Detections of VOCs, SVOCs, and cyanide were considered indicative of a potential release of that constituent to the media sampled. The potential release of VOCs and SVOCs was evaluated relative to it being detected at significant concentrations in samples. Detections of constituents that are generally accepted as artifacts of laboratory or sample handling were not considered significant. The human health potential significance of the detected value was assessed based on comparison to the generic industrial screening levels. Potential migration to groundwater was assessed based on comparison to the SSLs.

When a GISL was exceeded in RFI samples for an area, a human health risk assessment (Section 22) was conducted to assess the potential risk to human health for exposure scenarios that might occur in that area. When an SSL was exceeded in an area, indicating a potential for vertical migration of a constituent, other data for the area were evaluated to assess evidence of actual, significant vertical migration of the constituent. Other evidence included the horizontal and vertical distribution of the constituent and the presence or absence of the constituent in groundwater.

Groundwater Samples

RFI groundwater data were evaluated against the established groundwater standards, when available, and other risk-based values, as discussed in Subsection 3.2.2. Compounds detected in groundwater samples at levels above the comparison levels are highlighted on the summary data tables.



BASE MAP PROVIDED BY OTHERS.

LEGEND

- RMT SOIL BORING (1995)
- PECHINEY PROPERTY BOUNDARY
- KACC PROPERTY BOUNDARY (APPROXIMATE)

0 1500

SCALE IN FEET

FIGURE 3-1

SOIL SAMPLING LOCATIONS
AREA 10
BACKGROUND AREAS

CENTURY ALUMINUM
OF WEST VIRGINIA
RAVENSWOOD, WV

RMT INC. 70410.73
1299

/usr3/hydro/70410h//7040126/rfigre10.dgn
MCP 12-14-99

Table 3-1
RFI Target Parameters

Volatiles		
Chloromethane	Trichloroethene	Acrylonitrile
Bromomethane	Dibromochloromethane	Trichlorofluoromethane
Vinyl Chloride	1,1,2-Trichloroethane	Iodomethane
Chloroethane	Benzene	3-Chloro-1-propene
Methylene Chloride	trans-1,3-Dichloropropene	Acetonitrile
Acetone	Bromoform	trans-1,2-Dichloroethene
Carbon Disulfide	4-Methyl-2-pentanone	2-Chloro-1,3-butadiene
1,1-Dichloroethene	2-Hexanone	Propionitrile
1,1-Dichloroethane	1,2-Dibromoethane	Methacrylonitrile
trans-1,2-Dichloroethene	Tetrachloroethene	Isobutanol
Chloroform	Toluene	Vinyl acetate
1,2-Dichloroethane	1,1,2,2-Tetrachloroethane	Dibromomethane
2-Butanone	Chlorobenzene	Ethyl methacrylate
1,1,1-Trichloroethane	Ethyl Benzene	1,1,1,2-Tetrachloroethane
Carbon Tetrachloride	Styrene	1,2,3-Trichloropropane
Bromodichloromethane	Xylenes (Total)	trans-1,4-Dichloro-2-butene
1,2 – Dichloropropane	Dichlorodifluoromethane	1,2-Dibromo-3-chloropropane
cis - 1,3 – Dichloropropene	Acrolein	
Semivolatiles		
bis(2-Chloroethyl) ether	bis(2-Ethylhexyl)phthalate	N-Nitrosomorpholine
1,3-Dichlorobenzene	Di-n-octylphthalate	3-Methylphenol
1,4-Dichlorobenzene	Benzo(b)fluoranthene	N-Nitrosopiperidine
1,2-Dichlorobenzene	Benzo(k)fluoranthene	a,a-Dimethylphenethylamine
N-Nitrosodi-n-propylamine	Benzo(a)pyrene	o,o,o-Triethylphosphorothioate
Hexachloroethane	Indeno(1,2,3-cd)pyrene	Hexachloropropene
Nitrobenzene	Dibenz(a,h)anthracene	2,6-Dichlorophenol

Table 3-1
RFI Target Parameters

Semivolatiles (continued)		
Isophorone	Benzo(g,h,i)perylene	N-Nitrosodi-n-butylamine
bis(2-Chloroethoxy) methane	2,4-Dichlorophenol	p-Phenylenediamine
1,2,4-Trichlorobenzene	2,4-Dimethylphenol	Safrole
Naphthalene	2,4-Dinitrophenol	Isosafrole
4-Chloroaniline	4,6-Dinitro-2-methylphenol	1,2,4,5-Tetrachlorobenzene
Hexachlorobutadiene	2-Methylphenol	1,4-Naphthoquinone
2-Methylnaphthalene	2,2-Oxybis (1-Chloropropane)	1,3-Dinitrobenzene
Hexachlorocyclopentadiene	4-Methylphenol	Pentachlorobenzene
2-Chloronaphthalene	2-Nitrophenol	1-Naphthylamine
2-Nitroaniline	4-Nitrophenol	2-Naphthylamine
Dimethylphthalate	Pentachlorophenol	2,3,4,6-Tetrachlorophenol
Acenaphthylene	Phenol	5-Nitro-o-toluidine
2,6-Dinitrotoluene	2,4,5-Trichlorophenol	Diphenylamine
3-Nitroaniline	2,4,6-Trichlorophenol	1,3,5-Trinitrobenzene
Acenaphthene	2-Chlorophenol	Phenacetin
Dibenzofuran	Benzyl alcohol	Diallate
2,4-Dinitrotoluene	1,2-Dichlorobenzene	4-Aminobiphenyl
Diethylphthalate	4-Chloro-3-methylphenol	Pronamide
4-Chlorophenyl-phenyl ether	1,4-Dioxane	Pentachloronitrobenzene
Fluorene	Pyridine	4-Nitroquinoline-1-oxide
4-Nitroaniline	N-Nitrosodimethylamine	Dinoseb
N-nitrosodiphenylamine	Methyl methacrylate	Methapyrilene
4-Bromophenyl-phenylether	Ethyl methacrylate	Aramite
Hexachlorobenzene	2-Picoline	p-(Dimethylamino)azobenzene
Phenanthrene	N-Nitrosomethylethylamine	Chlorobenzilate
Anthracene	Methyl methanesulfonate	3,3'-Dimethylbenzidine

Table 3-1
RFI Target Parameters

Semivolatiles (continued)		
Di-n-butylphthalate	N-Nitrosodiethylamine	2-Acetylaminofluorene
Fluoranthene	Ethyl methanesulfonate	7,12-Dimethylbenz(a)anthracene
Pyrene	Pentachloroethane	Hexachlorophene
Butylbenzylphthalate	Aniline	3-Methylcholanthrene
3,3'-Dichlorobenzidine	o-Toluidine	Benzo (a) anthracene
N-Nitrosopyrrolidine	Chrysene	Acetophenone
PCBs		
Aroclor-1016	Aroclor-1242	Aroclor-1254
Aroclor-1221	Aroclor-1248	Aroclor-1260
Aroclor-1232		
RCRA Metals		
Arsenic	Chromium	Selenium
Barium	Lead	Silver
Cadmium	Mercury	
Cyanide		
Total	Free (weak acid dissociable)	Free (microdiffusion)
Miscellaneous		
PH	TSS	Oil & Grease (indicator)
Total Petroleum Hydrocarbons - Special Range Organics (indicator)		
TCLP - metals, semivolatiles	SPLP - metals, semivolatiles	

Table 3-2
Results of Field Parameter Monitoring in Groundwater

WELL NO.	SAMPLING DATE	SAMPLING METHOD	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (NTU)
Industrial Landfill						
MW-1	12/19/95	low rate purge	6.3	13	6,250	2
MW-1R	08/27/97	low rate purge	7.0	18	4,255	93
	10/15/97	low rate purge	7.0	15	5,355	92
MW-2	12/19/95	low rate purge	5.4	13	992	4
MW-4	12/20/95	low rate purge	7.2	12	882	2
LF-3	12/18/95	low rate purge	5.9	14	1,331	2
	08/24/97	low rate purge	7.0	15	1,210	3
LF-4	12/16/95	low rate purge	6.8	15	1,440	8
	08/27/97	low rate purge	7.2	16	819	16
LF-5	12/16/95	bailer	6.8	11	645	146
LF-6	12/14/95	low rate purge	6.0	14	369	1
	08/24/97	low rate purge	6.3	14	329	3
LF-7	12/15/95	low rate purge	6.1	12	937	2
	08/21/97	low rate purge	6.0	16	1,170	16
Old Landfill						
MW-6	12/20/95	bailer	7.5	12	882	>200
	08/24/97	low rate purge	7.0	18	2,052	23
MW-7	12/19/95	bailer	7.5	12	882	>200
	08/26/97	low rate purge	6.9	18	3,164	109
Sprayfield						
MW-8s	12/19/95	bailer	7.4	11	444	>200
	08/21/97	low rate purge	6.2	15	413	6
MW-8d	12/19/95	bailer	7.6	13	744	>200
	08/21/97	low rate purge	6.4	15	1,560	2

Table 3-2
Results of Field Parameter Monitoring in Groundwater

WELL NO.	SAMPLING DATE	SAMPLING METHOD	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (NTU)
Sprayfield (continued)						
K-201	12/18/95	low rate purge	5.9	10	516	26
	08/22/97	low rate purge	6.4	18	678	NM
K-202	12/18/95	low rate purge	6.9	11	512	33
K-203	12/17/95	low rate purge	7.1	15	960	77
	08/23/97	low rate purge	6.8	15	960	7
K-204	12/17/95	low rate purge	7.2	15	240	2
	08/23/97	low rate purge	6.1	14	309	2
	08/25/97	low rate purge	6.0	14	305	3
K-205	12/18/95	low rate purge	6.0	12	441	3
K-206	12/15/95	low rate purge	5.8	13	161	4
	08/19/97	low rate purge	5.7	16	250	1
K-207	12/15/95	low rate purge	5.9	13	496	1
	08/22/97	low rate purge	5.9	15	605	2
K-208	12/17/95	low rate purge	5.3	12	252	70
	08/19/97	low rate purge	6.5	18	690	104
K-209	12/17/95	low rate purge	6.0	13	750	2
	08/21/97	low rate purge	6.2	16	826	51
Interceptor Basins 002 and 004						
MW-5	08/27/97	low rate purge	7.1	18	798	47
	10/16/97	low rate purge	7.2	15	774	94
MW-9	08/28/97	low rate purge	7.3	20	1,210	31
	10/15/97	low rate purge	7.7	21	1,512	89

NTU Nephelmetric Turbidity Units
s.u. standard units
umhos/cm micromhos per centimeter adjusted to 25°C
> Greater than
NM Not measured

Table 3-3
Summary of Analytical Results
Area 10 - Background

PARAMETER (mg/kg)	LOCATION/DEPTH/SAMPLE DATE										
	SB-1001		SB-1002		SB-1003			SB-1004			
	10 - 12'	18 - 20'	3 - 5'	23 - 25'	3 - 5'	13 - 15'	(DUP-1022) 13 - 15'	13-15	(DUP-1023) 13-15	38-40	(DUP-1021) 38-40
	11/30/95		11/29/95		11/30/95			11/30/95			
VOLATILE ORGANICS											
Acetone	<0.005 Qu	<0.022 u	<0.011 Qu	<0.005 Qu	<0.076 u	0.22	0.19	0.22	NA	<0.027 u	NA
2-Butanone	<0.0057	<0.0055	<0.006	<0.006	<0.0056	<0.0052	<0.0058	<0.0066	NA	0.004 Q	NA
Tetrachloroethene	<0.0057	<0.0055	<0.006	<0.006	0.0008 Q	0.001 Q	0.001 Q	0.0007 Q	NA	0.0005 Q	NA
SEMIVOLATILE ORGANICS											
Di-n-butylphthalate	<0.38	<0.37	<0.4	<0.4	<0.38	<0.34	NA	<0.43	<0.43	<0.41	NA
bis(2-Ethylhexyl)phthalate	<0.38	0.037 J	0.065 J	0.043 J	<0.38	0.034 J	NA	0.089 J	0.043 J	0.1 J	NA
Di-n-octylphthalate	<0.38	<0.37	<0.4	<0.4	<0.38	0.053 J	NA	<0.43	<0.43	<0.41	NA
INORGANICS											
Arsenic	11	6.6	7.7	7.7	11	7.9	NA	7.8	NA	3.8	4.0
Barium	250	110	170	85	28	56	NA	140	NA	82	78
Cadmium	2.5	1.7	2.1	1.9	1.4	1.4	NA	2.0	NA	1.7	1.6
Chromium	12	13	14	11	7.3	4.5	NA	15	NA	11	11
Lead	11	9.4	12	9.2	9.0	8.7	NA	11	NA	9.6	9.7
Mercury	<0.11	<0.11	<0.12	<0.12	<0.11	<0.10	NA	<0.13	NA	<0.13	<0.12
Selenium	1.3	1.1	1.2	1.1 I	0.66	<0.52	NA	1.2	NA	0.66	<0.62
Silver	<1.1	<1.1	<1.2	<1.2	<1.1	<1.0	NA	<1.3	NA	<1.3	<1.2

J - Estimated concentration.
Q - Qualitative mass spectral evidence of analyte present; concentration is less than reporting limit.
u - Laboratory reported detection not validated during data validation process.
< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
NA - Not analyzed.

Table 3-4
Comparison Between Background Soil Sample Results

PARAMETER[a]	RFI Background Range	Twice Mean of RFI Background	Versar RFA Background	Regional Background[b]
VOLATILE ORGANICS				
Acetone	<0.005Ju - 0.22	NA	0.012	NA
2-Butanone	<0.0052 - 0.004 J	NA	NA	NA
Tetrachloroethene	<0.0055 - 0.0008 J	NA	NA	NA
SEMI-VOLATILE ORGANICS				
bis(2-Ethylhexyl)phthalate	<0.38 - 0.1 J	NA	0.88	NA
Di-n-octylphthalate	<0.37 - 0.053 J	NA	NA	NA
INORGANICS				
Arsenic	3.8 - 11	16	8.2	5.2 - 27
Barium	28 - 250	230	63[c]	300 - 700
Cadmium	1.4 - 2.5	3.7	2.8	1 - 4[d]
Chromium	4.5 - 15	22	1.2[c]	15 - 100
Lead	8.7 - 12	20	12	10 - 30
Mercury	<0.10 - <0.13	0.23	NA	0.03 - 0.59
Selenium	<0.52 - 1.3	1.9	1.4[c]	<0.1 - 1.2

[a]Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted.

[b]Ohio and West Virginia from Boerngen and Shacklette, 1981.

[c]Value is greater than instrument detection limit but less than contract required detection limit under CLP (Versar, 1988).

[d] Ohio and Virginia from Boerngen and Shacklette, 1981.

J - Estimated concentration; concentration is less than reporting limit.

u - Laboratory reported detection not validated during data validation process.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NA - Not available

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Table 3-5

Risk-Based Screening Levels for Soil and Groundwater

PARAMETER	SOIL (mg/kg)			GROUNDWATER (mg/L)
	GISLs		SSLs	
	CARCINOGENIC AND OTHER [1]	NONCARCINOGENIC HQ=0.1 [2]	MIGRATION TO GROUNDWATER [3]	
VOLATILE ORGANICS				
Acetone	NA	20,000	16	0.37 [18]
Benzene	200	NA	0.03	0.005 [19]
2-Butanone	NA	120,000	0.77 [4]	0.19 [18]
Carbon disulfide	NA	20,000	32	0.1 [18]
Chlorobenzene	NA	4,100	1	0.1 [19]
Chloroform	940	NA	0.6	0.1 [20]
1,1-Dichloroethane	NA	20,000	23	0.08 [18]
Dichlorodifluoromethane	NA	41,000	0.75 [4]	0.035 [18]
Ethylbenzene	NA	20,000	13	0.7 [19]
2-Hexanone	NA	8,200	1.4 [4]	0.15 [18]
4-Methyl-2-pentanone	NA	16,000	1.2 [4]	0.29 [18]
Methylene chloride	760	NA	0.02	0.0041 [18]
Tetrachloroethene	110	NA	0.06	0.005 [19]
1,1,2,2-Tetrachloroethane	29	NA	0.003 [13]	0.053 [18]
Toluene	NA	41,000	12	1.0 [19]
Trichloroethene	520	NA	0.06	0.005 [19]
Trichlorofluoromethane	NA	61,000	1.4 [4]	0.13 [18]
Xylene, total	NA	410,000	190 [14]	10.0 [19]
SEMIVOLATILE ORGANICS				
Acenaphthene	NA	12,000	570	0.22 [18]
Acenaphthylene	NA	61,000 [8]	215 [4,8]	1.1 [8]
Anthracene	NA	61,000	12,000	1.1 [18]
Benzo(a)anthracene	7.8	NA	2	0.000092 [18]
Benzo(b)fluoranthene	7.8	NA	5	0.000092 [18]
Benzo(k)fluoranthene	78	NA	49	0.00092 [18]
Benzo(g,h,i)perylene	78 [8a]	NA	286 [4,8a]	0.00092 [8a,18]
Benzo(a)pyrene	0.78	NA	8	0.0002 [19]
Chrysene	780	NA	160	0.0092 [18]
Diallate	94 [5]	NA	0.014 [4,5]	0.00017 [5]
Dibenzofuran	NA	820	NA	0.0024 [18]

Table 3-5
Risk-Based Screening Levels for Soil and Groundwater

PARAMETER	SOIL (mg/kg)			GROUNDWATER (mg/L)
	GISLs		SSLs	
	CARCINOGENIC AND OTHER [1]	NONCARCINOGENIC HQ=0.1 [2]	MIGRATION TO GROUNDWATER [3]	
Dibenz(a,h)anthracene	0.78	NA	2	0.0000092 [18]
Di-n-butylphthalate	NA	20,000	2,300 [15]	0.37 [18]
Dimethylphthalate	NA	2,000,000	266 [4]	37 [18]
Di-n-octylphthalate	NA	4,100	10,000 [15]	0.073 [18]
1,4-Dioxane	520	NA	0.03 [4]	0.0061 [18]
bis(2-Ethylhexyl)phthalate	410	NA	3,600	0.006 [19]
Fluoranthene	NA	8,200	4,300	0.15 [18]
Fluorene	NA	8,200	560	0.15 [18]
Indeno(1,2,3-cd)pyrene	7.8	NA	14	0.000092 [18]
2-Methylnaphthalene	NA	4,100	3.6 [4]	0.012 [18]
4-Methylphenol	NA	1,000	0.11 [4]	0.018 [18]
Naphthalene	NA	4,100	84	0.073 [18]
Phenanthrene	NA	61,000 [8]	1,012 [4,8]	1.1 [8]
Pyrene	NA	6,100	4,200	0.11 [18]
PCBs	25 [21]	NA	1 [16]	NA
INORGANICS				
Arsenic	38 [6]	NA	29 [17]	0.05 [20]
Barium	NA	14,000	1,600 [17]	2.0 [19]
Cadmium	NA	200 [9]	8 [17]	0.005 [19]
Chromium	NA	610 [10]	38 [10, 17]	0.1 [19]
Lead	400 [7]	NA	NA	0.015 [19]
Mercury	NA	61 [11]	2.1 [4,11]	0.002 [19]
Selenium	NA	1,000	5 [17]	0.05 [19]
WET CHEMISTRY				
Cyanide, total	NA	41,000 [12]	NA	NA
Cyanide, weak acid dissoc.	NA	NA		0.2 [20]
Fluoride	NA	NA		4.0 [19]

Notes for Table 3-5

[1] USEPA Region III Risk-Based Concentration for carcinogenic constituents in industrial soils dated October 1, 1998 (Risk Target = 10^{-6} unless otherwise noted).

[2] USEPA Region III Risk-Based Concentration for noncarcinogenic constituents in Industrial Soils dated October 1, 1998 (Hazard Quotient = 0.1).

[3] USEPA Soil Screening Guidance - Technical Background Document, May 1996, DAF = 20.

[4] Calculated using USEPA Soil Screening Guidance - Technical Background Document, Eqn. (22).

[5] Constituent was removed from the USEPA Region III RBC Table dated October 1, 1998. GISL obtained from most recent USEPA Region III Risk-Based Concentration Table listing the constituent (October 22, 1997).

[6] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.

[7] A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).

[8] Toxicity of compound similar to anthracene; RBC for anthracene used to develop GISL for this parameter.

[8a] Toxicity of compound similar to benzo(k)fluoranthene; RBC for anthracene used to develop GISL for this parameter.

[9] The GISL for cadmium is based on the value for food.

[10] The GISL and SSL for chromium are based on the values for hexavalent chromium

[11] The GISL for mercury is based on the value for mercuric chloride. The SSL for mercury is calculated for inorganic mercury.

[12] The GISL for cyanide is based on the value for potassium silver cyanide.

[13] Concentration is at or below Contract Laboratory program required quantitation limit for Regular Analytical Services (RAS).

[14] Based on the value for *o*-xylene which represents the most conservative value for the xylene isomers

[15] Soil saturation concentration (C_{sat})

[16] A preliminary remediation goal of 1 mg/kg has been set for PCBs based on *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* (USEPA, 1990) and on USEPA efforts to manage PCB contamination.

[17] SSL for pH of 6.8

[18] USEPA Region III Risk-Based Concentration for Tap Water, October 1, 1998 (Risk Target = 10^{-6}, Hazard Quotient = 0.1).

[19] Appendix A to West Virginia Groundwater Standards Title 46, Series 12, Number 3, dated July 1, 1998.

[20] Maximum Contaminant Level, Federal Primary Drinking Water Standards

[21] TSCA restricted access cleanup standard (40 CFR 761 Subpart G)

NA - Not applicable.

Section 4
Area 1 - Old Northwest Pot Dump and Associated Areas

Area 1 is composed of four sections: the Old Northwest Pot Dump, the current and former Old Northwest Pot Dump Drainage Paths, the Bottomlands, and an area south of the Bottomlands. The locations of these areas are illustrated on Figure 4-1.

From approximately 1959 to 1963, KACC accumulated spent potliner in a borrow pit northwest of the Reduction Plant. The spent potliner deposited in the pit was from monolithic pots containing 1 percent to 2 percent total cyanide. KACC stopped using the borrow pit for spent potliner storage in 1963 when the former potliner loadout building at the Potliner Loadout Area (Area 2) was installed. By the end of 1963, KACC had removed the spent potliner from the borrow pit. The pit was backfilled and graded in 1980. This former borrow pit is now referred to as the Old Northwest Pot Dump.

Beginning in 1959, storm water drainage from the Old Northwest Pot Dump followed an established route to the Bottomlands. Storm water drainage ran northwest for approximately 450 feet, made a 90° bend, ran southwest for approximately 280 feet, made another 90° bend, and again ran northwest, eventually accumulating in a low-lying area near the riverbank referred to as the Bottomlands. Aerial photographs show that between September 1961 and September 1964, the drainage path was modified to its current configuration. As indicated on Figure 4-1, the upper and lower sections of the former and current drainage paths from the Old Northwest Pot Dump to the Bottomlands coincide.

The Bottomlands is a low-lying area within the 5-year flood elevation of the Ohio River where surface water runoff from the northwestern portion of the property accumulates. The Bottomlands are divided into a northern and a southern section. Topographic elevations indicate storm water flow within the Bottomlands is northward and drains to the Ohio River through a concrete pipe at its northern end. Areas of disturbed vegetation have been observed in the Bottomlands.

Aerial photographs indicate a former area of disturbed vegetation located south of the Bottomlands, adjacent to the covered alumina ore conveyor. Activities associated with this disturbed area, termed "Area South of Bottomlands," are not known.

4.1 Previous Investigations

In 1981-82, Dames & Moore (D&M) conducted a hydrogeologic investigation specifically aimed at defining the extent of cyanide in groundwater in the areas of potliner management. Soil sampling was also performed to identify possible sources for the cyanide found in groundwater. Five soil borings, designated S5 to S9, were drilled in the Old Northwest Pot Dump; five soil borings, designated S1 to S4, and S10, were drilled west of the dump in the vicinity of the drainage paths; and five soil borings, designated S12 to S16, were drilled in the northern section of the Bottomlands. Approximate locations of the D&M borings are illustrated on Figure 4-1.

Soil samples collected by D&M were analyzed for cyanide by the KACC Laboratory and by an outside commercial laboratory. The method of analysis consisted of drying the sample, then pulverizing and mixing it. One gram of the mixed material was placed in 20 milliliters of distilled water and agitated vigorously. After settling, the decant was analyzed for total cyanide. The method was intended to measure the maximum amount of cyanide that would be released to water passing through the soil. Extraction efficiency experiments indicate that the deionized water extraction procedures used for this determination recover about 80 percent of the total available cyanide (D&M, 1982). Because the method used by D&M analyzed the amount of total cyanide leached from the soil into the water, this report refers to the D&M cyanide results as "leachable cyanide." Table 4-1 summarizes the results of the D&M soil investigation conducted in this area.

During the D&M soil investigation, perched water was encountered on the east side of the Old Northwest Pot Dump at approximately 4 to 6 feet below grade. Temporary drive points, installed within and west of the Old Northwest Pot Dump, indicated that the perched water was limited to a small portion of the Old Northwest Pot Dump (D&M, 1982).

4.2 RFI Sampling Program

Fourteen soil borings were drilled and sampled as part of the RFI conducted in Area 1. The soil sampling program and field screening results are summarized in Appendix J. Three soil borings, designated SB-101 through SB-103 on Figure 4-1, were drilled in the Old Northwest Pot Dump. Soil samples were collected at 5-foot intervals for approximately 20 feet, beginning at the base of the former borrow pit. Continuous sampling was conducted, beginning near ground surface, to identify the contact between the fill material and the base of the former borrow pit. In addition, the on-site borrow pit from which the fill was obtained was examined to characterize the nature of material used as fill in this area. The material used as fill and the naturally occurring soils were nearly identical. Identification of the contact was subjective, based on appearance and sorting of the material. The amount of fill present in borings SB-101 through SB-103 was estimated to be between 4 feet and 9 feet. Perched water was encountered

in boring SB-103 at a depth of 8 feet below ground surface, and in boring SB-101 at a depth of 19 feet below ground surface. These observations are consistent with those made in the D&M Report.

Three soil borings, designated SB-104 through SB-106 on Figure 4-1, were drilled along the current drainage path from the Old Northwest Pot Dump to the Bottomlands. Borings SB-104 and SB-106 were located where the current drainage path coincides with the former one. Soils became saturated with water at a depth of 5 feet below ground surface in borings SB-104 and SB-105.

Six soil borings, designated SB-107 through SB-112 on Figure 4-1, were drilled within the Bottomlands. One boring, designated SB-113, was located along the pathway draining the northern section of the Bottomlands. One additional soil boring, designated SB-114, was drilled in the Area South of the Bottomlands. Groundwater was not encountered in any of these borings. Soil samples from borings drilled along the drainage path, in the Bottomlands, and the Area South of the Bottomlands were collected at ground surface and at 5-foot intervals to a depth of 10 feet below grade.

Soil samples collected from Area 1 were analyzed for total cyanide. As requested by USEPA, soil samples from borings SB-102, SB-104, SB-106, SB-108, and SB-111 were analyzed for RCRA metals. Selected intervals from borings SB-108 and SB-111 were also analyzed for Appendix IX VOCs and SVOCs. Results of analyses performed on soil samples collected from Area 1 are summarized on Tables 4-2 and 4-3. Laboratory reports are included in Appendix I. The 13-foot to 15-foot, 18-foot to 20-foot, and 24-foot to 26-foot sample intervals from boring SB-101 were inadvertently not analyzed for total cyanide.

4.3 Discussion of Analytical Results

With three exceptions, total cyanide concentrations for samples collected from Area 1 ranged from not detected to 76 mg/kg. Surface soil samples from borings SB-109 and SB-112 contained total cyanide at 230 mg/kg. The 3-foot to 5-foot sample from SB-109 contained total cyanide at 150 mg/kg. These sampling locations are underlain by sampling intervals with very low cyanide concentrations. Borings SB-109 and SB-112 are located at the southern ends of the two segments of the Bottomlands. All cyanide concentrations detected in soils from Area 1 were below the generic industrial screening level.

Seven of the eight metals analyzed were detected in soil samples collected from Area 1; silver was not detected. With three exceptions, metal concentrations were below the RFI site background level. The concentration of barium in SB-108, 0 feet to 0.5 feet, was 240 mg/kg, which exceeded twice the mean background level (used as RFI site background), but was

within the range (28 mg/kg to 250 mg/kg) observed in the RFI background samples. Selenium was detected above RFI site background in SB-108, 0 feet to 0.5 feet (2.9 mg/kg), and mercury was detected above RFI site background in SB-111, 3 feet to 5 feet (0.43 mg/kg). Both borings are located in the Bottomlands within the 5-year flood level of the Ohio River. Concentrations of these metals return to RFI site background levels in samples collected from lower sampling depths. All of the reported metal concentrations were below the industrial screening levels and SSLs.

Two soil samples collected from Area 1 were analyzed for Appendix IX VOCs and SVOCs. Both samples were located in the Bottomlands. No VOC detections met the data validation criteria. No SVOCs were detected.

4.4 Findings and Conclusions for Area 1

- Total cyanide was not detected above generic industrial screening levels in soil samples collected from Area 1.
- VOCs and SVOCs were not detected in soil samples collected from the Bottomlands.
- Metals were not detected above generic industrial screening levels or SSLs in soil samples collected from Area 1.
- A human health risk assessment is not warranted for Area 1.
- No further investigation is warranted for Area 1.
- No further action is necessary in Area 1.

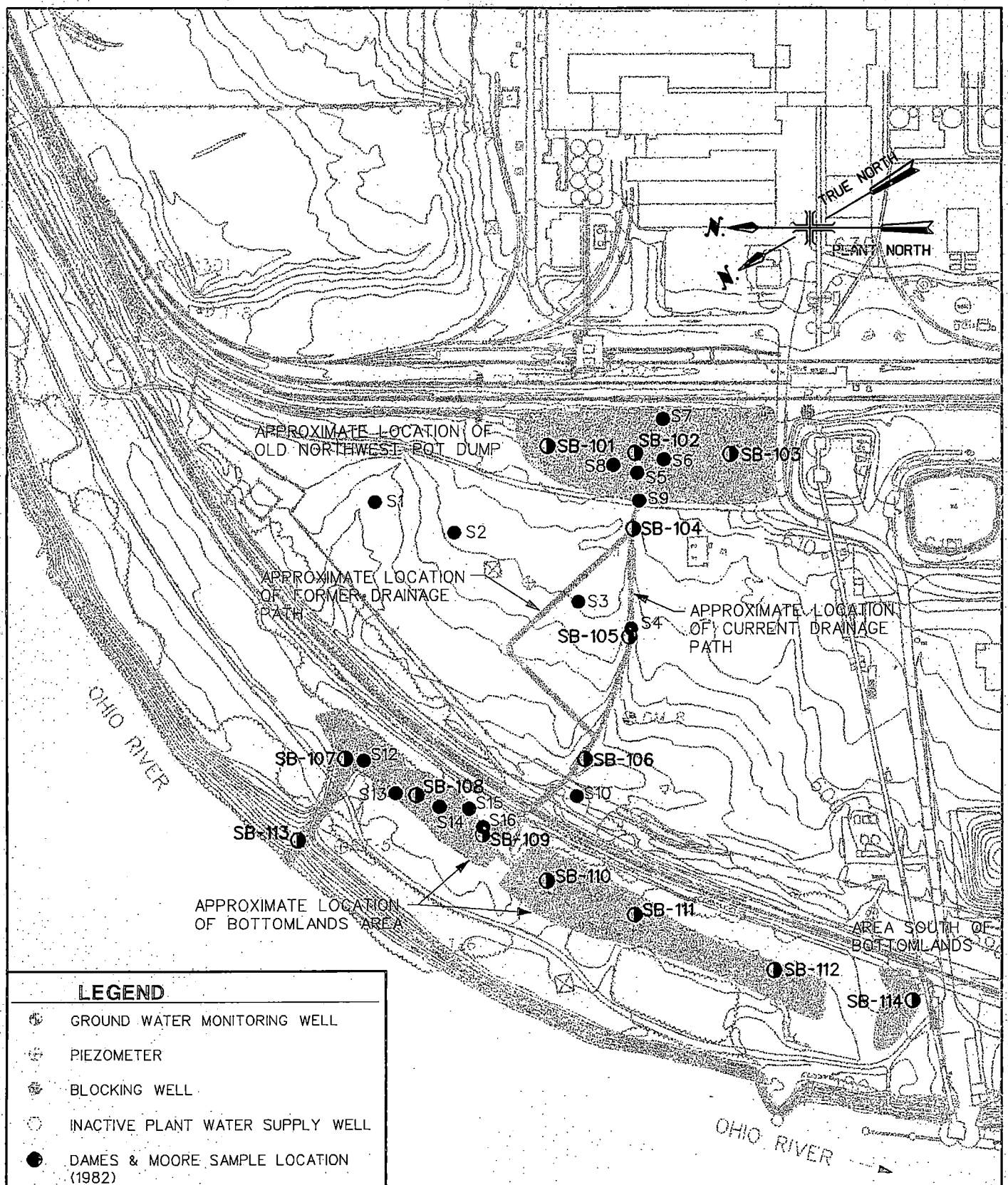


FIGURE 4-1

SOIL SAMPLING LOCATIONS
AREA 1
OLD NORTHWEST POT DUMP AND ASSOCIATED AREAS

RMT, Inc. 70410.73

CENTURY ALUMINUM OF WEST VIRGINIA

Table 4-1
Summary of Dames Moore Soil Investigation -
Old Northwest Pot Dump and Associated Areas[a]

DEPTH (feet below grade)	CYANIDE IN SOIL SAMPLES (mg/kg)									
	West of Old NW Pot Dump					Old NW Pot Dump				
	S1	S2	S3	S4	S10	S5	S6	S7	S8	S9
0	0.094	0.084	0.039	0.96	0.32	0.66	1.8	0.62	0.43	0.56
1.5	0.032	0.028	<0.02	0.31	0.079	6.2	6.3	3.0	0.72	0.17
5	<0.02	<0.02	0.04	0.51	0.1	150	38	10	15	<0.02
10	<0.02	<0.02	1.7	0.47	<0.02	<0.02	350	930	2.1	0.8
15	<0.02	<0.02	34	0.37	<0.02	38	40	9.9	230	1300
20	0.029	<0.02	14	0.43	<0.02	0.075	57	13	0.47	0.77
25	NS	NS	NS	0.7	<0.02	2.2	600	NS	0.25	0.71
30	NS	NS	NS	NS	0.043	0.05	270	NS	NS	NS
35	NS	NS	NS	NS	1.2	0.039	NS	NS	NS	NS
40	NS	NS	NS	NS	0.55	0.034	NS	NS	NS	NS

DEPTH (feet below grade)	CYANIDE IN SOIL SAMPLES (mg/kg)				
	Bottomlands				
	S12	S13	S14	S15	S16
0	31	520	500	190	260
1.5	220	390	1000	1300	350
5	0.59	3.1	130	8.5	41
10	0.11	0.4	<0.02	0.085	0.066
15	0.051	0.35	0.054	0.058	0.054
20	0.051	0.053	0.024	0.099	1.1

[a] Data obtained from Dames & Moore, 1982.

############

< - Concentration less than the Quantitation Limit.

NS - Not sampled.

Table 4-2
Summary of Total Cyanide
Area 1 - Old Northwest Pot Dump and Associated Areas

LOCATION	GENERIC INDUSTRIAL SCREENING LEVEL [1]	SAMPLE DATE	DEPTH (feet)	TOTAL CYANIDE (mg/kg)
SB-101	41,000 [a]	12/6/95 [b]	4 - 6	15
(DUP-121)		12/3/95	8 -10	76
SB-102		12/5/95	5 - 7	2.4
			10 - 12	4.2
			15 - 17	7.2
			20 - 22	9.0
			25 - 27	6.4
SB-103		12/5/95	9 - 11	39
			13 - 15	2.5
			18 - 20	1.4
			23 - 25	0.90
			28 - 30	<0.54
SB-104		12/4/95	0 - 0.5	2.1
			3 - 5	1.2
			8 - 10	<0.60
SB-105		12/4/95	0 - 0.5	<0.60
			3 - 5	0.85
			8 - 10	0.72
SB-106		12/4/95	0 - 0.5	1.1
			3 - 5	1.2
			8 - 10	<0.60

[1] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).
[a] The GISL for cyanide is based on the value for potassium silver cyanide.
[b] Sample interval collected from adjacent boring following identification of the base of the fill.
< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
Shading indicates concentration exceeds the generic industrial screening level.

Table 4-2
Summary of Total Cyanide
Area 1 - Old Northwest Pot Dump and Associated Areas

LOCATION	GENERIC INDUSTRIAL SCREENING LEVEL [1]	SAMPLE DATE	DEPTH (feet)	TOTAL CYANIDE (mg/kg)
SB-107	41,000 [a]	12/4/95	0 - 0.5	6
			3 - 5	11
			8 - 10	1.5
SB-108		12/3/95	0 - 0.5	42
			3 - 5	31
			8 - 10	4.5
SB-109		12/4/95	0 - 0.5	230
			3 - 5	150
			8 - 10	<0.62
SB-110		12/3/95	0 - 0.5	3.3 j
			3 - 5	18 j
			8 - 10	20 j
SB-111		12/4/95	0 - 0.5	<0.63
			3 - 5	3.1
			8 - 10	5
SB-112		12/3/95	0 - 0.5	230
			3 - 5	23 j
			8 - 10	6.0 j
SB-112 (Dup-122)		12/3/95	8-10	5.4 j
SB-113		12/4/95	0 - 0.5	11
			3 - 5	1.7
			8 - 10	1.5
SB-113 (Dup-123)		12/4/95	3-5	2.7
SB-114		12/3/95	0 - 0.5	14
			3 - 5	9
			8 - 10	2.9 j

[1] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).
[a] The GISL for cyanide is based on the value for potassium silver cyanide.
[b] Sample interval collected from adjacent boring following identification of the base of the fill.
< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
Shading indicates concentration exceeds the generic industrial screening level.

Table 4-3
Summary of Inorganic Constituents
Area 1 - Old Northwest Pot Dump and Associated Areas

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE				
				SB-102				
				5 - 7'	10 - 12'	15 - 17'	20 - 22'	25 - 27'
				12/5/95				
Arsenic	16	38 [a]	29	5.0 I	11	6.1	2.4	5.3
Barium	230	14,000	1,600	110	58	64	42	60
Cadmium	3.7	200 [b]	8	1.3	1.6	0.86	0.58	0.80
Chromium	22	610 [c]	38 [c]	13	9.7	5.0	7.0	5.2
Lead	20	400 [d]	NA	13 I	12	6.8	6.2	5.9
Selenium	1.9	1,000	5	1.3 I	1.1	0.94	0.70	0.63

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE						
				SB-104			SB-106			
				0 - 0.5'	3 - 5'	8 - 10'	0 - 0.5'	(DUP-124) 0 - 0.5'	3 - 5'	8 - 10'
				12/4/95			12/4/95			
Arsenic	16	38 [a]	29	7.2	11	9.9	8.1	7.8	7.7	10
Barium	230	14,000	1,600	89	63	47	82	90	54	72
Cadmium	3.7	200 [b]	8	1.1	1.7	1.7	1.5	1.5	1.5	1.8
Chromium	22	610 [c]	38 [c]	11	10	11	11	9.2	11	12
Lead	20	400 [d]	NA	13	12	11	13	13	9.9	13
Selenium	1.9	1,000	5	1.1	1.2	1.1	1.5	1.4	1.1	1.2

[1] Site Background is 2x the mean of the site background samples (see Chpt.3.2.4).
[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).
[3] USEPA Soil Screening Guidance - Technical Background Document, May 1996, DAF = 20.
[4] SSL for pH of 6.8.
[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.
[b] The GISL for cadmium is based on the value for food.
[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.
[d] A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).
I - Estimated concentration due to severe matrix interferences.
NA - Not available
Shading indicates concentration exceeds both Site Background and the generic industrial screening level.
Bold text indicates concentration exceeds both Site Background and the migration to groundwater SSL.

Table 4-3
Summary of Inorganic Constituents
Area 1 - Old Northwest Pot Dump and Associated Areas

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3,4]	LOCATION/DEPTH/SAMPLE DATE					
				SB-108			SB-111		
				0 - 0.5'	3 - 5'	8 - 10'	0 - 0.5'	3 - 5'	8 - 10'
				12/3/95			12/5/95		
Arsenic	16	38 [a]	29	11	11	9.1	6.7	7.2	8.2
Barium	230	14,000	1,600	240	130	100	43	150	120
Cadmium	3.7	200 [b]	8	2.8	2.5	2.2	1.4	2.1	2.2
Chromium	22	610 [c]	38 [c]	15	16	13	7.2	16	15
Lead	20	400 [d]	NA	19	16	12	8.2	16	15
Mercury	0.23	61 [e]	2.1 [f]	<0.12	<0.12	<0.12	<0.12	0.43	<0.12
Selenium	1.9	1,000	5	2.9	1.9	1.1	0.8	1.7	1.6

[1] Site Background is 2x the mean of the site background samples (see Chpt. 3.2.4).
[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).
[3] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.
[4] SSL for pH of 6.8.
[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.
[b] The GISL for cadmium is based on the value for food.
[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.
[d] A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).
[e] The GISL for mercury is based on the value for mercuric chloride.
[f] The SSL for mercury is based on inorganic mercury - calculated per SSG-TBD, Eqn. 22.
< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
NA - Not available
Shading indicates concentration exceeds both Site Background and the generic industrial screening level.
Bold text indicates concentration exceeds both Site Background and the migration to groundwater SSL.

Section 5
Area 2 - Potliner Loadout Area

The Potliner Loadout Area includes the former potliner loadout building and ramp to the Ohio River, and a drainage swale located north of the former building. Potliner Loadout activities were conducted in this area from 1963 to 1970. The building was used to accumulate spent potliner awaiting shipment. The building had a concrete foundation that measured approximately 120 feet by 100 feet. The structure had concrete walls on two sides that were situated perpendicular to the Ohio River. The two concrete walls supported a roof over the building. The remaining two sides of the building were open. Spent potliner was unloaded through one open end of the building, and moved out the other open end, down a concrete ramp, and onto barges. KACC ceased using the potliner loadout building in 1970. The only parts of the Potliner Loadout Area structures still standing are two parallel walls that likely extended from the former building along the ramp to the river.

The drainage swale, although not related to the potliner loadout activities, was included in Area 2 because a 1970 aerial photograph showed disturbed vegetation. Activities associated with this area are not known.

5.1 Previous Investigations

In 1981-82, D&M collected soil samples from three soil borings drilled in the Potliner Loadout Area. The approximate locations of the D&M borings, designated S31 through S33, are illustrated on Figure 5-1.

Soil samples were collected from each boring at the surface and at approximate 5-foot intervals to a depth of 25 feet. Soil samples collected by D&M were analyzed for leachable cyanide using the methodology described in Subsection 3.1. Table 5-1 summarizes the results of the D&M soil investigation conducted in this area.

5.2 RFI Sampling and Analysis Program

Six soil borings, designated SB-201 through SB-206 on Figure 5-1, were drilled and sampled as part of the RFI conducted in Area 2. The soil sampling program and field screening results are summarized in Appendix J. Borings SB-201 and SB-202 were drilled along the edge of the drainage swale where visibly disturbed vegetation was observed in a 1970 areal photograph. Borings SB-203 through SB-206 were drilled to investigate potential soil impacts from former potliner loadout activities.

The 1995 RFI Workplan specified sample intervals of 0 to 0.5 feet, 3 to 5 feet, and 8 to 10 feet for each of the borings in this area. Various debris, including rock, brick, concrete, cinder, asphalt, carbon, and wood, was encountered in borings SB-204, SB-205, and SB-206. The location of this material would be consistent with its use as a fill material during construction of the ramp. Because the drilling equipment was unable to penetrate this material, boring SB-204 was terminated at 7 feet, and boring SB-206 was terminated at 6 feet. Boring SB-205 was extended the full 10 feet. Pieces of material assumed to be spent potliner were observed around the ramp.

Soil samples collected from Area 2 were analyzed for total cyanide. As requested by USEPA, soil samples collected from borings SB-202, SB-203, and SB-204 were analyzed for RCRA metals. Selected intervals from borings SB-202 and SB-204 were also analyzed for Appendix IX VOCs and SVOCs. Results of analyses performed on soil samples collected from the Potliner Loadout Area are summarized on Table 5-2 through Table 5-4. Laboratory reports are included in Appendix I.

5.3 Discussion of Analytical Results

Total cyanide was detected in one or more soil samples collected from each of the borings drilled at the Potliner Loadout Area. Total cyanide concentrations ranged from not detected to 11 mg/kg. Detected total cyanide concentrations were below the generic industrial screening level for cyanide.

Seven of the eight RCRA metals were detected in soil samples collected from Area 2; silver was not detected. Two samples contained metals at concentrations above site background levels. The concentration of chromium in sample SB-203, 0 to 0.5 feet (23 mg/kg) slightly exceeded the 22 mg/kg site background level. Chromium returned to background concentrations in deeper sample intervals collected from this boring. The concentration of chromium did not exceed the generic industrial screening level or the SSL for migration to groundwater.

The concentration of lead in SB-204, 5 to 7 feet (25 mg/kg) slightly exceeded the 20 mg/kg site background level. This concentration does not exceed the generic industrial screening level. Lead does not have an SSL for migration to groundwater.

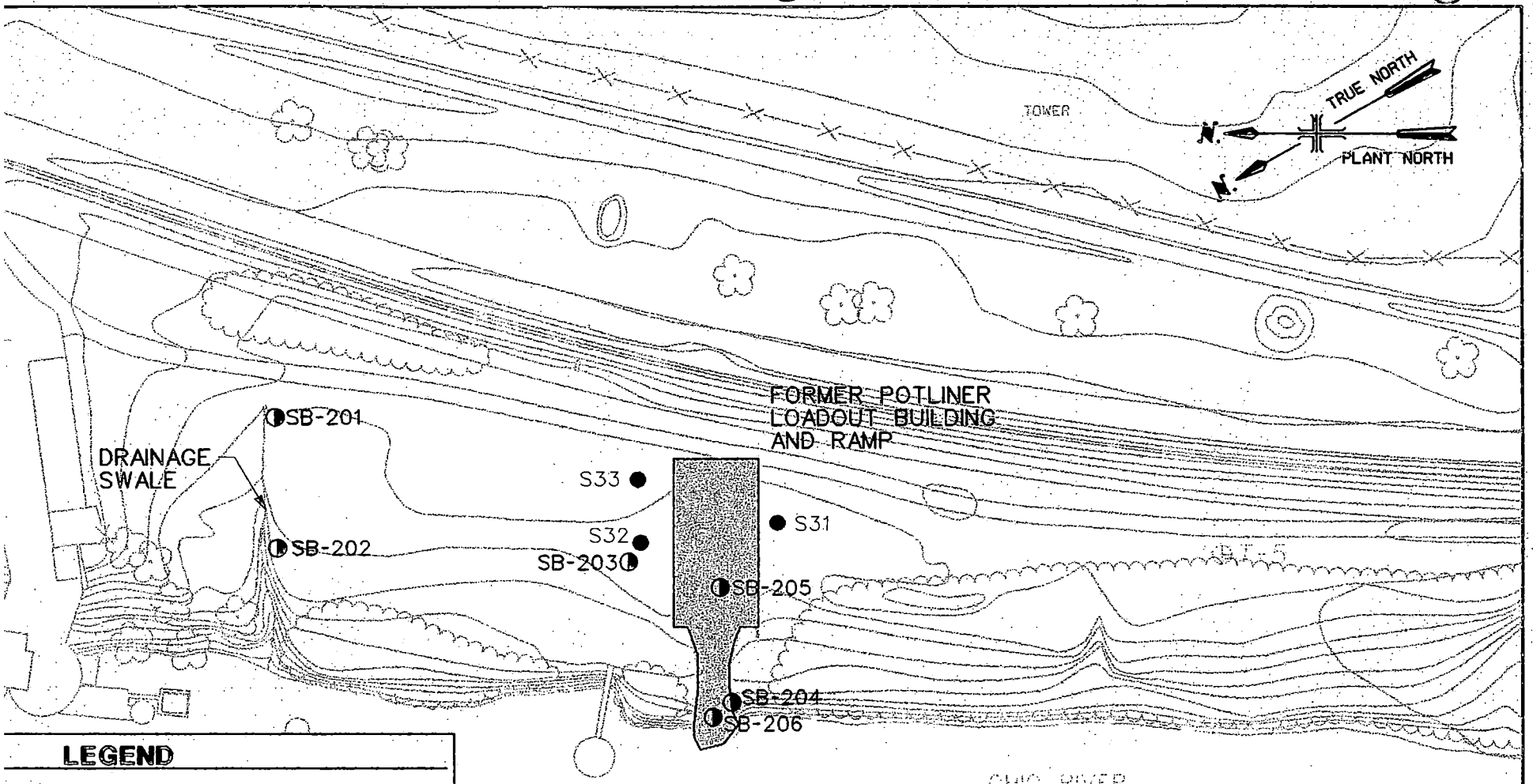
Two soil samples collected from this area were analyzed for Appendix IX VOCs and SVOCs. No VOC detections met the data validation criteria. Fifteen PAHs were detected in one sample, the 5-foot to 7-foot sample collected from boring SB-204, one of which exceeded its generic industrial screening level. Benzo(a)pyrene was detected in this sample at an estimated concentration of 3.4 mg/kg. This concentration exceeds the generic industrial screening level, but is below the SSL for migration to groundwater. Two constituents, dibenzofuran at an

estimated concentration of 1.1 mg/kg and benzo(a)anthracene at an estimated concentration of 4.3 mg/kg, exceeded their respective SSL concentrations for potential migration to groundwater. However, since the PAH concentrations were detected in a sample that contained debris and other samples at the site with PAH-containing debris had no vertical migration based on underlying soil samples (Area 5, Area 14), these PAHs are not expected to migrate.

The SVOCs detected in boring SB-204 are likely related to the materials used as fill in this area, and not the result of releases from former potliner management activities. However, because the 5-foot to 7-foot sample from boring SB-204 exceeded the generic industrial screening level for benzo(a)pyrene, a site-specific human health risk assessment for benzo(a)pyrene in this area is provided in Section 22. The risk assessment concludes that acceptable risk levels are not exceeded under the construction exposure scenario.

5.4 Findings and Conclusions for Area 2

- Total cyanide was not detected in soil samples collected from Area 2 at concentrations above the generic industrial screening level.
- VOCs were not detected in soil samples collected from Area 2.
- Metals were not detected in soil samples collected from Area 2 at concentrations above generic industrial screening levels or SSLs.
- Benzo(a)anthracene and dibenzofuran were detected in the 5-foot to 7-foot sample collected from boring SB-204 at a concentration exceeding their migration to groundwater screening levels. These parameters are likely related to the material used as fill in this area. Because the concentrations did not exceed generic industrial screening levels and are unlikely to migrate, no further evaluation of these parameters is needed.
- Benzo(a)pyrene was detected in the 5-foot to 7-foot sample collected from boring SB-204 at a concentration exceeding its generic industrial screening level. This constituent is included in the human health risk assessment presented in Section 22. The risk assessment concluded that acceptable risk levels are not exceeded.
- No further action is needed in Area 2.



LEGEND

- PIEZOMETER
- DAMES & MOORE SAMPLES (1982)
- RMT SOIL BORING (1995)

NOTE: DAMES & MOORE SAMPLE LOCATIONS ARE APPROXIMATE.

0 100
SCALE IN FEET

FIGURE 5-1

SOIL SAMPLING LOCATIONS
AREA 2
FORMER POTLINER LOADOUT AREA

RMT 70410.73
1299

CENTURY ALUMINUM
OF WEST VIRGINIA
RAVENSWOOD, WV

sr3/hydro/70410h/7040126/rfiarea2.dgn
12-14-99

Table 5-1
Summary of Dames Moore Soil Investigation - Potliner Loadout Area[a]

DEPTH (feet below grade)	CYANIDE IN SOIL SAMPLES (mg/kg) LOCATION		
	S31	S32	S33
0	1100	19	41
1.5	NS	2.4	NS
5	1.3	3.4	8.9
10	0.65	3.6	0.2
15	0.052	0.057	0.072
20	0.12	0.065	0.49
25	0.048	0.076	0.44

[a] Data derived from Dames & Moore, 1982.

12/16/1999 14:44

NS - Not sampled.

Table 5-2
Summary of Total Cyanide [1]
Area 2 - Potliner Loadout Area

GENERIC INDUSTRIAL SCREENING LEVEL [2]	DEPTH (feet)	LOCATION/SAMPLE DATE					
		SB-201	SB-202	SB-203	SB-204	SB-205	SB-206
		12/4/95	12/5/95	12/4/95	12/5/95	12/5/95	12/4/95
41,000 [a]	0 - 0.5	<0.60	1.3	1.2	<0.62	8.7	1.8
	3 - 5	1.1	5.4	1	NS	11	4.8
	5 - 7	NS	NS	NS	3.3	NS	NS
	8 - 10	<0.60	0.82	<0.59	NS	2.7	NS

[1] Analytical results are reported in milligrams per kilogram (mg/kg) *total* cyanide.

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[a] The GISL for cyanide is based on the value for potassium silver cyanide.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NS - Not sampled.

Shading indicates concentration exceeds the generic industrial screening level.

Table 5-3
Summary of Inorganic Constituents
Area 2 - Potliner Loadout Area

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE							
				SB-202			SB-203			SB-204	
				0 - 0.5'	3 - 5'	8 - 10'	0 - 0.5'	3 - 5'	8 - 10'	0 - 0.5'	5 - 7'
				12/5/95			12/4/95			12/5/95	
Arsenic	16	38 [a]	29	7.8	7.9	8.2	8.2	11	9.5	6.0	9.8
Barium	230	14,000	1,600	130	170	120	12	160	170	130	160
Cadmium	3.7	200 [b]	8	2.1	2.1	2.1	1.7	2.9	2.6	<0.61	2.7
Chromium, total	22	610 [c]	38 [c]	15	14	13	23	19	20	19	20
Lead	20	400 [d]	NA	16	14	13	14	16	16	19	25
Mercury	0.23	61 [e]	2.1 [f]	<0.12	<0.12	<0.12	<0.12	<0.12	<0.15	<0.12	0.18
Selenium	1.9	1,000	5	1.6	1.5	1.1	1.0	1.2	1.1	0.87	1.4

[1] Site Background is 2x the mean of the site background samples (see Chpt. 3.2.4).

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[3] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.

[4] SSL for pH of 6.8.

[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.

[b] The GISL for cadmium is based on the value for food.

[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.

[d] A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).

[e] The GISL for mercury is based on the value for mercuric chloride.

[f] The SSL for mercury is based on inorganic mercury - calculated per SSG-TBD, Eqn. 22.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NA - Not available

Shading indicates concentration exceeds both Site Background and the generic industrial screening level.

Bold text indicates concentration exceeds both Site Background and the migration to groundwater SSL.

Table 5-4
Summary of Organic Constituents
Area 2 - Potliner Loadout Area

PARAMETER (mg/kg)	GENERIC INDUSTRIAL SCREENING LEVEL [1]	MIGRATION TO GROUNDWATER [2]	LOCATION/DEPTH/SAMPLE DATE	
			SB-202	SB-204
			3 - 5'	5 - 7'
			12/5/95	12/5/95
SEMIVOLATILE ORGANICS				
Acenaphthene	12,000	570	<0.4	1.3 J
Dibenzofuran	820	0.79 [a]	<0.4	**1.1 J**
Fluorene	8,200	560	<0.4	1.6 J
Phenanthrene	61,000 [b]	1,012 [a,b]	<0.4	11
Anthracene	61,000	12,000	<0.4	3.5 J
Fluoranthene	8,200	4,300	<0.4	11
Pyrene	6,100	4,200	<0.4	8.1
Benzo(a)anthracene	7.8	2	<0.4	**4.3 J**
Chrysene	780	160	<0.4	4.1 J
Benzo(b)fluoranthene	7.8	5	<0.4	3.2 J
Benzo(k)fluoranthene	78	49	<0.4	2.5 J
Benzo(a)pyrene	0.78	8	<0.4	3.4 J
Indeno(1,2,3-cd)pyrene	7.8	14	<0.4	1.8 J
Dibenz(a,h)anthracene	0.78	2	<0.4	0.48 J

[1] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[2] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.

[a] Calculated using SSG-TBD, Eqn. 22.

[b] Surrogate compounds (see Chpt. 3.2.2) used to develop screening levels.

J - Estimated concentration; concentration is less than reporting limit.

u - Laboratory reported detection not validated during data validation process.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NA - Not available

Shading indicates concentration exceeds the generic industrial screening level.

Bold text indicates concentration exceeds the migration to groundwater SSL.

Section 6
Area 3 - Former Potliner Management Areas

Area 3 is composed of six sections: KACC's Potliner Pile, the former Pot Soaking Piers, the former Pot Soaking Pits and Elephant Shed, the Drainage Path, Outfall 003, and an Area South of the Drainage Path. The first three sections represent units where spent potliner was previously managed by KACC. The next two sections describe storm water drainage routes associated with these units. The last section was added because aerial photographs indicated previously disturbed vegetation. The locations of the sections comprising Area 3 are illustrated on Figure 6-1. Because of their location and relationship to one another, these six sections are grouped under the broad title of Former Potliner Management Areas, although spent potliner was managed at other locations at the facility.

From 1963 to 1970, separation of the potliner from the pots was conducted on the Pot Soaking Piers. The piers consisted of large concrete blocks situated on a concrete pad. Four pots could be placed on top of the concrete blocks at one time. The pots were filled with water allowing the potliner to expand and the liners to break apart. The pots were then placed on the concrete pad and the liners were removed. Drainage from the Pot Soaking Piers discharged through sewers to Outfall 003. KACC dismantled the piers in late 1970. No evidence of the piers remains.

In 1970, KACC constructed the Pot Soaking Pits and Elephant Shed, resulting in an integrated system for potliner breakout and accumulation. The Pot Soaking Pits consisted of four, 6-foot deep reinforced concrete pits that could each hold one totally submerged pot. The Elephant Shed consisted of a concrete floor with concrete walls on three sides. Following soaking, the pots were removed from the pits and the potliner was broken out by repeatedly dropping them on a concrete pad imbedded with railroad rails. From 1970 to 1972, potliner and other materials broken out from the pots were temporarily placed in the Elephant Shed while awaiting off-site shipment. From 1972 to 1979, the broken out potliner and associated materials were accumulated in the Elephant Shed and, about once a week, these materials were placed in the Potliner Pile. KACC ceased using the Pot Soaking Pits and Elephant Shed for breakout and accumulation of potliner in 1979. KACC cleaned out, filled in, and covered the Pot Soaking Pits with asphalt around 1980. The Elephant Shed is currently used to store construction debris, flue bricks, and dirt.

The Potliner Pile, which is still owned by KACC, began as a concrete pad (Pad 1) in 1972. KACC accumulated spent potliner on this pad, as well as two adjacent pads-one constructed in 1974 (Pad 2) and the other in 1976 (Pad 3). The concrete pads were constructed with 18-inch sidewalls. Pad 1 and, reportedly, Pad 2 drained to a sump located at the northwest corner of Pad 1, which discharged accumulated fluids to the Pot Soaking Pits. A leak detection pipe was constructed beneath Pad 3. Pad 3 also had drains within the sidewalls on its north and west sides that routed accumulated water to the Pad 1 sump. These drains and the pipe connecting the sump to the Pot Soaking Pits were reportedly removed when the Pot Soaking Pits were backfilled in 1980.

In 1979, a cover was placed over the three pads. The cover was constructed of asphalt on the top and gunite on the sides. In February 1980, spent potliner from the Potliner Breakout and Accumulation Buildings was placed on a foundation of bentonite and soil, south of the existing covered concrete pads. A catch basin was installed at the southwest corner of this foundation to collect accumulated water. Around 1982, an ethylene propylene diene monomer (EPDM) cover was installed over the original and subsidiary piles.

Storm water runoff from the former potliner management areas drained westward, following an established path to the Ohio River. From approximately 1976 to 1979, a small earthen dam retained storm water runoff approximately halfway along the drainage path. The original drainage path has been filled and regraded; however, runoff still follows the same general westward path. Discharge to the river has been altered. Currently, once it passes beneath the plant fence, it enters a surface drain into a culvert that discharges to Outfall 003.

Outfall 003 is located on the bank of the Ohio River, approximately 250 feet south of the discharge point from the former Drainage Path. Water from the Pot Soaking Piers was discharged to the Ohio River through Outfall 003 prior to issuance of the facility's first NPDES Permit. In 1974, Outfall 003 was permitted as a storm water outfall to the Ohio River.

6.1 Previous Investigations

In 1981 and 1982, D&M collected soil samples from 15 borings drilled around the Potliner Pile and former Drainage Path. The approximate locations of the D&M borings, designated S17 through S27 and S34 through S37, are illustrated on Figure 6-1.

Soil samples were collected from each boring at and near the surface and at 5-foot intervals to depths of 20 feet to 50 feet below ground surface. Soil samples collected by D&M were analyzed for leachable cyanide using the methodology described in Subsection 4.1. Table 6-1 summarizes the results of the D&M soil investigation conducted in this area.

Leachable cyanide concentrations for samples collected from Area 3 ranged from 0.038 mg/kg to 1,600 mg/kg. The highest cyanide concentrations reported by D&M were present in the 10-foot sample intervals from boring S17 (1,600 mg/kg) and boring S19 (1,000 mg/kg). Both borings were located on the west side of the Potliner Pile. Logs from these borings described the samples as a dark grayish-black to black silty sand with clay and gravel.

According to the D&M Report (1982), KACC personnel dug two test pits in May 1982 to inspect the sidewalls of the below grade concrete foundation of the pile. One pit was dug along the north side of the pile at the west end, and the other was dug near the center of the west side of the pile. Water was observed seeping out between the top of the sidewall and the cover on both the north and west sides of the pile. The asphalt cover material on the west side was reported to be in poor condition. In both test pits the soil was described as dark and wet with an ammonia odor. The D&M report also references reports from KACC personnel that suggest the ground surface on the west side of the pile was exposed to leachate during pot handling operations, and this area was subsequently buried. The EPDM cover was installed to prevent further infiltration of storm water and generation of leachate.

In 1986, NUS Corporation (NUS) conducted an RFA to identify potential releases of hazardous waste or hazardous waste constituents to the environment. The 1986 RFA Report prepared by NUS refers to three soil samples collected by WV DNR along the drainage swale near the northwest corner of the Elephant Shed. Approximate sample locations, designated GS-2 through GS-4, are illustrated on Figure 6-1. The samples were analyzed for VOCs and SVOCs. Results of the WV DNR analyses are summarized on Table 6-2. Trace levels of three VOCs (ethylbenzene, toluene, and xylene) and two SVOCs (acenaphthylene, and phenanthrene) were detected in the soil sample collected closest to the Elephant Shed.

In 1987, Versar conducted a second RFA. Versar collected two soil samples at visible drainage locations off the northwest and southeast corners of the Elephant Shed. Approximate sample locations, designated CH-934 and CH-935, are illustrated on Figure 6-1. Soil samples were analyzed for VOCs and base-neutral extractable compounds. The results of the analyses are summarized on Table 6-3.

The northwest drainage sample (CH-935) collected by Versar contained trace levels of four VOCs: acetone, methylene chloride, trichloroethene (TCE), and toluene. One VOC, methylene chloride, was detected in the southeast drainage sample (CH-934). Several PAHs were detected in both the northwest and southeast drainage samples.

6.2 RFI Sampling and Analysis Program

The Potliner Pile is owned and maintained by KACC. Consequently, investigation of potential releases from the pile to the subsurface was beyond the scope of the RFI activities conducted by CAWV. Sampling was conducted during the 1995 RFI to assess possible soil impacts on CAWV's property from potential storm water runoff from KACC's Potliner Pile before it was covered. Subsequent to CAWV's 1995 RFI sampling event, KACC performed an RFI on the Potliner Pile. Results from the KACC RFI Report (KACC 1997) have been used in this document to supplement the data collected by CAWV.

During CAWV's 1995 RFI sampling event, 17 soil borings and one sediment boring were drilled and sampled in Area 3. The sampling program and field screening results are summarized in Appendix J. Nine soil borings, designated SB-301 through SB-309 on Figure 6-1, were drilled around the Potliner Pile and former location of the Pot Soaking Piers. Soil samples were collected at the surface and at 5-foot intervals to a depth of 20 feet below grade.

Three soil borings, designated SB-316 through SB-318 on Figure 6-1, were drilled and sampled near the former Pot Soaking Pits and Elephant Shed. Borings SB-316 and SB-318 were located in the drainage swales running along the northwest and southwest sides of the Elephant Shed, respectively. Boring SB-317 was located outside the west wall of the Elephant Shed. Soil samples were collected at the surface and at 5-foot intervals to a depth of 20 feet below grade.

Four soil borings, designated SB-310 through SB-313 on Figure 6-1, were drilled and sampled along the drainage path leading from the Potliner Pile and associated areas. Soil samples from borings SB-310, SB-311, and SB-312 were collected at 5-foot intervals to a depth of 20 feet below grade. Because the drainage path has been filled and regraded, surface soil samples were not collected. Boring SB-313 was located along the bank of the Ohio River where drainage from the former path was discharged. Soil samples from this boring were collected at the surface and 3 feet to 5 feet below grade.

Two sediment/soil samples were collected from a hand auger boring located near the discharge point of Outfall 003. The boring location, designated SD-314, is illustrated on Figure 6-1. Samples were collected at the surface and at 3 feet to 5 feet below grade.

One soil boring, designated SB-315 on Figure 6-1, was drilled and sampled in the area south of the Drainage Path. This boring was placed in an area observed to be void of vegetation. Blue-green staining of the surface soil was also noted. Soil samples were collected at the surface and at 5-foot intervals to a depth of 20 feet below grade.

Soil samples collected from Area 3 were analyzed for total cyanide using SW-846 methods. As requested by USEPA, soil samples from borings SB-308, SB-311, SB-313, SB-315, SB-316, and SB-318 were also analyzed for RCRA metals. Selected intervals from borings SB-311, SB-313, SB-315, SB-316, and SB-318 were analyzed for Appendix IX VOCs and SVOCs. Results of analyses performed on soil samples collected from Area 3 are summarized in Table 6-4 through Table 6-6. Laboratory reports are included in Appendix I.

In April 1996, KACC installed three monitoring wells around the Potliner Pile. The locations of these wells, designated SPL-1 through SPL-3, are included on Figure 6-1. Beginning at a depth of 20 feet and terminating at the water table, soil samples were collected in 10-foot intervals, composited, and analyzed for total cyanide. The results of KACCs soil sampling are summarized on Table 6-7. Groundwater samples were collected from each of the wells on four occasions; May 7, August 8, and September 19, 1996, and August 1998. Groundwater sample analyses from the KACC wells included total cyanide, weak acid dissociable cyanide, free cyanide, and fluoride. The results of KACCs groundwater sampling are summarized on Table 6-8. A site-wide evaluation of the cyanide present in groundwater is presented in Section 20.

6.3 Discussion of Analytical Results

With one exception, the total cyanide concentrations for soil/sediment samples collected by CAWV from Area 3 ranged from not detected to 36 mg/kg. One sample, the 13-foot to 15-foot interval collected from boring SB-309, contained total cyanide at 270 mg/kg. The underlying sample interval (18 feet to 20 feet) contained total cyanide at 21 mg/kg.

The boring log for SB-309 was not consistent with logs of the other borings drilled in Area 3. The soil sample collected from 13 feet to 15 feet was described as a dark brown, sticky gravel with clay and sand. In addition, wood and silver-black carbon-like material was logged at 8 feet below grade. This description was consistent with descriptions given by D&M for borings S17 and S19, also located on the west side of the pile.

The total cyanide concentrations for soil samples collected by KACC from boring SPL-3 ranged from 1.7 mg/kg to 180 mg/kg. Total cyanide was not detected in borings SPL-1 and SPL-2. Total cyanide concentrations in all soil samples collected by CAWV and KACC from Area 3 were below the generic industrial screening level for cyanide.

Total cyanide and weak acid dissociable cyanide were detected in each of the three monitoring wells installed and sampled by KACC; free cyanide was not detected. The concentration of weak acid dissociable cyanide exceeded the 0.2 mg/L groundwater standard in wells SPL-1 and SPL-3 during the August and September 1996 sampling events. Groundwater samples

collected from the three SPL wells in August 1997 did not exceed the groundwater screening level. Recovery of the cyanide in groundwater is being accomplished by the blocking well system. Further discussion of cyanide concentrations in groundwater is presented in Section 20.

Seven of the eight metals analyzed were detected in soil samples collected from Area 3; silver was not detected. Samples collected from three borings drilled in Area 3 contained metals at concentrations above site background levels. The surface soil sample collected from boring SB-308 contained chromium and lead at concentrations above site background. The concentration of total chromium also exceeded the SSL for migration of hexavalent chromium to groundwater. The chromium in this sample is unlikely to be hexavalent, as discussed in Subsection 3.2.2. Metals concentrations returned to background levels in the 3-foot to 5-foot sample collected from this boring. All metals concentrations in samples collected from boring SB-308 were below industrial screening levels.

Cadmium, chromium, lead, mercury and selenium were detected in the 0-foot to 0.5-foot and 3-foot to 5-foot samples collected from boring SB-313 at levels above site background. Total chromium in the 3-foot to 5-foot sample also exceeded the SSL for migration of hexavalent chromium to groundwater. Again, the chromium in this sample is unlikely to be hexavalent. All metals concentrations in samples collected from boring SB-313 were below industrial screening levels. Boring SB-313 is located within the 1-year flood plain of the Ohio River. Periodic flooding of SB-313 is likely responsible for the levels of constituents detected in these samples, not releases from the former Potliner Management Units.

The surface soil sample collected from boring SB-318 contained cadmium, chromium, lead, and mercury at concentrations above site background. Metals concentrations returned to background levels in the 3-foot to 5-foot sample collected from this boring. All metals concentrations in samples collected from boring SB-318 were below industrial screening levels.

Five soil samples collected from Area 3 were analyzed for Appendix IX VOCs and SVOCs. Acetone was reported in the 3-foot to 5-foot sample from SB-311 at an estimated concentration; acetone was also reported in the associated method blank. No other VOC detections met the data validation criteria. No SVOCs were detected at concentrations above their SSLs for migration to groundwater or their industrial screening levels.

6.4 Subsequent Investigation

In August 1997, following a recent rainfall event, CAWV personnel discovered a puddle of reddish-colored liquid in a drainage swale located within Area 3 property just north of the Potliner Pile. Erosion had exposed a small portion of an otherwise buried concrete slab. The puddle was observed in a cavity located just underneath the down slope edge of the concrete slab. The concrete slab appeared to extend southward beneath the property boundary fence surrounding the Potliner Pile.

The analytical results from a sample of the reddish-colored liquid indicated the presence of total cyanide and fluoride. Upon receipt of the laboratory analyses, CAWV notified USEPA as required by its consent order. The reddish-colored puddle reappeared in September 1997 following a heavy rainfall. CAWV again collected a sample and notified USEPA. The analytical results indicated the presence of total cyanide and fluoride, weak acid dissociable cyanide, and iron.

In correspondence dated November 20, 1997, USEPA requested CAWV to conduct interim measures for the puddle and report its findings to USEPA. In an agreement between CAWV and KACC, KACC agreed to conduct the interim measures investigation in accordance with CAWV's Consent Order and with CAWV oversight. In December 1997, KACC visited the site to observe the discolored puddle and develop an approach for the Interim Measures (IM) investigation. Straw bales were placed around and down slope of the puddle to limit erosion and control surface water flow. A plan for removing the concrete slab and sampling underlying soils was approved by USEPA in May 1998.

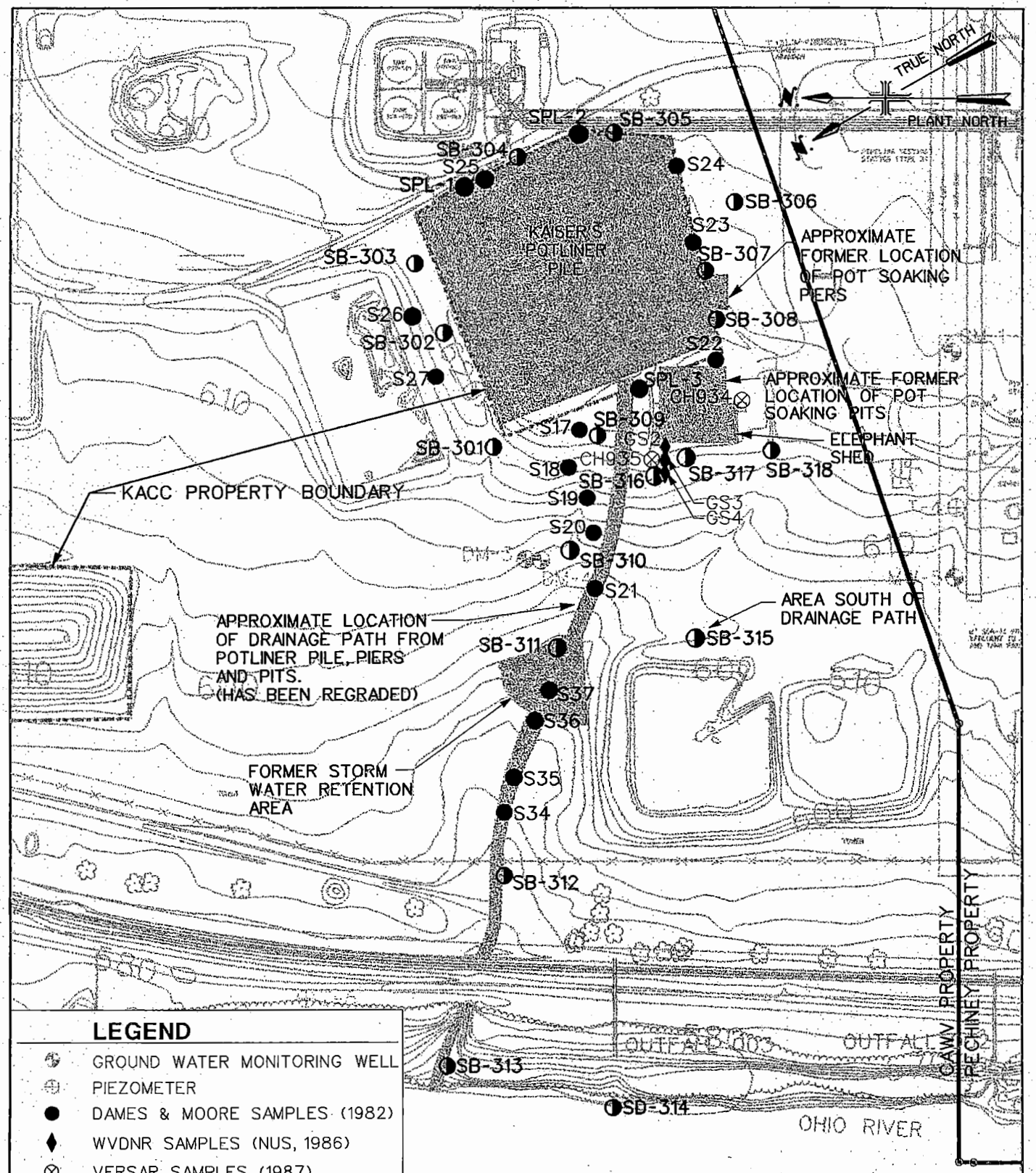
KACC implemented the workplan in June 1998. CAWV collected soil and liquid samples from beneath the concrete pad concurrent with the investigation activities performed by KACC. The results of CAWV's sampling were submitted to KACC on July 1, 1998. On July 14, 1998, KACC submitted a preliminary document titled *Interim Measures Report for the Discolored Puddle* (CEC, 1998). The final report was submitted by CAWV to USEPA in October 1999. The results of the interim measures investigation are not included in this RFI report.

6.5 Findings and Conclusions for Area 3

The following findings and conclusions are based on sampling conducted for the RFI:

- The concentrations of total cyanide remaining in Area 3 soils do not exceed the industrial screening level for cyanide.
- Total cyanide and weak acid dissociable cyanide are present in groundwater beneath the Potliner Pile. Recovery of cyanide in groundwater is being accomplished by the blocking well system.

- Surface soil samples collected from borings SB-308 and SB-318 contained one or more metals at concentrations above site background levels. Concentrations of total chromium in the SB-308 sample also exceeded the SSL for migration of hexavalent chromium to groundwater. Metal concentrations returned to background levels in the 3-foot to 5-foot samples collected from these borings. No metals concentrations exceeded industrial screening levels.
- Surface and 3-foot to 5-foot samples collected from boring SB-313 contained metals at levels above site background. Total chromium in the 3-foot to 5-foot sample also exceeded the SSL for migration of hexavalent chromium to groundwater. No metal concentrations exceeded industrial screening levels. The presence of metals above background levels in this boring is attributed to periodic flooding of SB-313 by the Ohio River and not to release from former potliner management areas.
- VOCs and SVOCs were not detected in samples collected from Area 3 at levels above SSLs or industrial screening levels.
- A human health risk assessment is not warranted for Area 3.
- A puddle of discolored liquid was discovered in Area 3 in August 1997. The discolored puddle was investigated separately from the RFI, and the report was submitted by CAWV to USEPA in October 1999.
- No further soil investigation is warranted for Area 3 under the CAWV Consent Order.
- Based on RFI results, no further action regarding soils is necessary for Area 3.



LEGEND

- GROUND WATER MONITORING WELL
- PIEZOMETER
- DAMES & MOORE SAMPLES (1982)
- WVDNR SAMPLES (NUS, 1986)
- VERSAR SAMPLES (1987)
- RMT SOIL BORING (1995)
- KACC MONITORING WELL

NOTE: DAMES & MOORE, WVDNR AND VERSAR SAMPLE LOCATIONS ARE APPROXIMATE.

0 200
SCALE IN FEET

FIGURE 6-1

RFI SOIL SAMPLING LOCATIONS
AREA 3
FORMER POTLINER
MANAGEMENT AREAS

RMT 70410.73
1299

CENTURY ALUMINUM
OF WEST VIRGINIA
RAVENSWOOD, WV

K:/usr3/hydro/70410h/7041026/rfiarea3.dgn

Table 6-1
Summary of Dames & Moore Soil Investigation - Potliner Pile Area

DEPTH (feet below grade)	CYANIDE IN SOIL SAMPLES (mg/kg)								
	Drainage Path								
	S17	S18	S19	S20	S21	S34	S35	S36	S37
0	0.75	1.5	23	NS	3.3	2.5	18	7.6	6.9
1.5	0.85	1.2	54	0.46	140	7.4	40	20	18
5	0.56	250	51	330	1	0.38	14	8.7	1.4
10	1600	120	1000	4.5	0.61	0.099	6.9	4.8	8.9
15	120	220	31	2.3	0.33	0.12	9.8	4.5	590
20	320	25	20	41	0.15	0.055	5.4	9.9	25
25	320	10	8.3	9.9	0.084	0.038	1.6	5.9	4.2
30	220	78	2.4	NS	0.091	NS	NS	NS	NS
35	NS	NS	NS	NS	0.096	NS	NS	NS	NS
40	NS	NS	NS	NS	0.12	NS	NS	NS	NS
45	NS	NS	NS	NS	0.073	NS	NS	NS	NS
50	NS	NS	NS	NS	0.076	NS	NS	NS	NS

DEPTH (feet below grade)	CYANIDE IN SOIL SAMPLES (mg/kg)					
	Potliner Pile					
	S22	S23	S24	S25	S26	S27
0	NS	3.4	2.7	0.83	0.61	4.4
1.5	NS	2.1	0.34	3.5	2.2	17
5	47	0.053	0.44	36	0.35	0.69
10	130	29	1.6	270	0.098	0.18
15	110	43	0.21	68	0.64	1.1
20	46	100	0.056	7.4	1.1	1.4
25	56	NS	NS	11	NS	NS
30	39	NS	NS	2.3	NS	NS
35	33	NS	NS	NS	NS	NS
40	35	NS	NS	NS	NS	NS

NS - Not sampled.
Data derived from Dames & Moore, 1982.

Table 6-2
Summary of WVDNR Soil Sampling - Elephant Shed Area

PARAMETER[a]	SAMPLE DESIGNATION		
	GS-2	GS-3	GS-4
VOLATILE ORGANICS			
Ethylbenzene	0.003	ND	ND
Toluene	0.169	0.008	ND
Xylene, total	0.012	ND	ND
SEMI-VOLATILE ORGANICS			
Acenaphthylene	0.5	ND	ND
Phenanthrene	4.0	NQ	NQ

[a] Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted.
[b] Data derived from NUS, 1986.
ND - Not detected.
NQ - Detected but not quantified.

Table 6-3
Summary of Versar RFA Investigation - Elephant Shed Area

PARAMETER[a]	VERSAR SAMPLE DESIGNATION	
	CH-934	CH-935
VOLATILE ORGANICS		
Acetone	UJ	0.007 B
Methylene chloride	0.033 J	0.013
Trichloroethene	UJ	0.014
Toluene	UJ	0.006
SEMI-VOLATILE ORGANICS		
Acenaphthylene	ND	0.163 J
Phenanthrene	0.34 J	0.501 J
Anthracene	ND	0.49 J
Fluoranthene	1.435	1.515
Pyrene	1.214	1.2
Benzo(a)anthracene	0.695 J	0.63 J
Chrysene	0.806	0.7
bis(2-Ethylhexyl)phthalate	0.541 J	0.466 J
Benzo(b)fluoranthene	0.607 J	0.455 J
Benzo(k)fluoranthene	0.64 J	0.49 J
Benzo(a)pyrene	0.585 J	0.49 J
Indeno(1,2,3-cd)pyrene	0.43 J	ND

[a] Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted.
[b] Data derived from Versar, 1988.
B - Not detected substantially above the level reported in laboratory or field blank. (Versar, 1988)
J - Analyte present; reported value may not be accurate or precise. (Versar, 1988)
UJ - Not detected; quantitation limit may be inaccurate or imprecise. (Versar, 1988)
ND - Not detected or not analyzed.

Table 6-4
Summary of Total Cyanide [1]
Area 3 - Former Potliner Management Areas

GENERIC INDUSTRIAL SCREENING LEVEL [2]	DEPTH (feet)	LOCATION/SAMPLE DATE										
		SB-301	SB-302	SB-303	SB-304	SB-304 (DUP322)	SB-305	SB-306	SB-306 (DUP321)	SB-307	SB-307 (DUP325)	SB-308
		12/1/95	12/1/95	12/1/95	12/1/95	12/1/95	12/1/95	12/1/95	12/1/95	12/2/95	12/2/95	12/2/95
41,000 [a]	0 - 0.5	4.6	28	2.7	<0.55	NS	2.3 j	1.3	NS	1.2	NS	1.9
	3 - 5	14	3.5	0.85	1.8	NS	1.9	<0.54	NS	<0.56	NS	<0.54
	8 - 10	6.5	1.8	NS	<0.53	<0.53	1.2	0.86	NS	1.5	NS	<0.54
	13 - 15	7.6	11	2.8	<0.54	NS	<0.54	<0.54	NS	NS	NS	<0.54
	18 - 20	4.6	7.3	4.2	<0.54	NS	<0.56	<0.51	0.67	<0.54	2.0	<0.54

GENERIC INDUSTRIAL SCREENING LEVEL [2]	DEPTH (feet)	LOCATION/SAMPLE DATE											
		SB-309	SB-310	SB-311	SB-312	SB-313	SD-314	SB-315	SB-315 (DUP323)	SB-316	SB-317	SB-317 (DUP324)	SB-318
		12/3/95	12/3/95	12/3/95	12/4/95	12/5/95	12/2/95	12/2/95	12/2/95	12/3/95	12/2/95	12/2/95	12/3/95
41,000 [a]	0 - 0.5	<0.63	NS	NS	NS	<0.71	<0.68	36	28	<0.60	<0.60	NS	0.92
	3 - 5	2.5	5.3	4.6	2.1	14	3.7	15	NS	<0.56	<0.53	NS	<0.54
	8 - 10	26	1.6	0.98	0.72	NS	NS	1.6	NS	24	0.65	NS	<0.55
	13 - 15	270	<0.56	1.5	2.7	NS	NS	0.72	NS	24	7.5	10	<0.54
	18 - 20	21	0.56	1.1	0.60	NS	NS	<0.53	NS	7.3	30	NS	<0.53

[1] Analytical results are reported in milligrams per kilogram (mg/kg) *total* cyanide.

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[a] The GISL for cyanide is based on the value for potassium silver cyanide.

NS - Not sampled.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

Shading indicates concentration exceeds the generic industrial screening level.

Table 6-5
Summary of Inorganic Constituents
Area 3 - Former Potliner Management Areas

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE				
				SB-308				
				0 - 0.5'	3 - 5'	8 - 10'	13 - 15'	18 - 20'
Arsenic	16	38 [a]	29	6.7	5.4	4.9	7.6	4.7
Barium	230	14,000	1,600	130	45	41	42	26
Cadmium	3.7	200 [b]	8	1.4	0.86	0.81	0.97	0.99
Chromium	22	610 [c]	38 [c]	**41**	6.8	6.5	8.1	5.5
Lead	20	400 [d]	NA	29	5.7	5.5	7.7	4.2
Mercury	0.23	61 [e]	2.1 [f]	<0.12	0.14	0.14	<0.11	<0.11
Selenium	1.9	1,000	5	1.1	0.58	0.57	<0.55	0.63

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE					
				SB-311				SB-313	
				3 - 5'	8 - 10'	13 - 15'	18 - 20'	0 - 0.5'	3 - 5'
Arsenic	16	38 [a]	29	6.4	9.8	8.0	7.8	9.2	17
Barium	230	14,000	1,600	130	68	56	56	120	180
Cadmium	3.7	200 [b]	8	1.2	2.0	1.4	1.2	2.9	6.4
Chromium	22	610 [c]	38 [c]	12	12	10	6.1	25	**98**
Lead	20	400 [d]	NA	9.8	12	8.9	7.1	35	140
Mercury	0.23	61 [e]	2.1 [f]	<0.12	<0.12	<0.11	<0.11	0.21	0.90
Selenium	1.9	1,000	5	<0.63	0.99	0.64	0.55	2.2	3.3

[1] Site Background is 2x the mean of the site background samples (see Chpt. 3.2.4).

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[3] USEPA Soil Screening Guidance - Technical Background Document, May 1996, DAF = 20.

[4] SSL for pH of 6.8.

[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.

[b] The GISL for cadmium is based on the value for food.

[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.

[d] A screening level of 400 mg/kg has been set for lead based on the *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).

[e] The GISL for mercury is based on the value for mercuric chloride.

[f] The SSL for mercury is based on inorganic mercury - calculated per SSG-TBD, Eqn. 22.

NA - Not available

< - Conc. less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

Shading indicates concentration exceeds both Site Background and the GISL.

Bold indicates concentration exceeds Site Background and the migration to groundwater SSL.

Table 6-5
Summary of Inorganic Constituents
Area 3 - Former Potliner Management Areas

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE				
				SB-316				
				0 - 0.5'	3 - 5'	8 - 10'	13 - 15'	18 - 20'
				12/3/95				
Arsenic	16	38 [a]	29	10	8.2	10	6.2	8.9
Barium	230	14,000	1,600	80	72	58	46	64
Cadmium	3.7	200 [b]	8	1.7	1.3	1.6	1.2	1.5
Chromium	22	610 [c]	38 [c]	13	14	7.5	7.4	8.3
Lead	20	400 [d]	NA	15	12	8.1	6.4	6.8
Mercury	0.23	61 [e]	2.1 [f]	<0.12	<0.11	<0.11	<0.11	<0.11
Selenium	1.9	1,000	5	0.95	<0.55	0.96	0.64	0.88

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE				
				SB-318				
				0 - 0.5'	3 - 5'	8 - 10'	13 - 15'	18 - 20'
				12/3/95				
Arsenic	16	38 [a]	29	13	7.1	7.0	5.3	9.1
Barium	230	14,000	1,600	140	26	24	24	26
Cadmium	3.7	200 [b]	8	4.1	1.5	1.1	0.90	1.2
Chromium	22	610 [c]	38 [c]	33	5.6	6.1	6.5	5.0
Lead	20	400 [d]	NA	59	7.4	7.0	7.4	6.4
Mercury	0.23	61 [e]	2.1 [f]	0.24	<0.11	<0.11	<0.11	<0.11
Selenium	1.9	1,000	5	1.9	0.65	<0.55	<0.54	<0.53

[1] Site Background is 2x the mean of the site background samples.
[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).
[3] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.
[4] SSL for pH of 6.8.
[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.
[b] The GISL for cadmium is based on the value for food.
[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.
[d] A screening level of 400 mg/kg has been set for lead based on the *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).
[e] The GISL for mercury is based on the value for mercuric chloride.
[f] The SSL for mercury is based on inorganic mercury - calculated per SSG-TBD, Eqn. 22.
< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.
NA - Not available
Shading indicates concentration exceeds both Site Background and the generic industrial screening level. Bold text indicates concentration exceeds both Site Background and the migration to groundwater SSL.

Table 6-5
Summary of Inorganic Constituents
Area 3 - Former Potliner Management Areas

PARAMETER (mg/kg)	SITE BACKGROUND [1]	GENERIC INDUSTRIAL SCREENING LEVEL [2]	MIGRATION TO GROUNDWATER [3, 4]	LOCATION/DEPTH/SAMPLE DATE					
				SB-315					
				0 - 0.5'	3 - 5'	8 - 10'	13 - 15'	18 - 20'	(DUP-326) 18 - 20'
				12/2/95					
Arsenic	16	38 [a]	29	9.5	9.0	9.8	11	7.4	5.7
Barium	230	14,000	1,600	59	59	42	63	38	34
Cadmium	3.7	200 [b]	8	1.7	1.6	1.8	1.9	1.2	0.82
Chromium	22	610 [c]	38 [c]	10	10	9.8	10	4.9	4.6
Lead	20	400 [d]	NA	13 I	10	10	11	5.8	6.3
Selenium	1.9	1,000	5	0.85	0.83	0.69	0.82	<0.52	0.67

[1] Site Background is 2x the mean of the site background samples.

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[3] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.

[3] SSL for pH of 6.8.

[a] USEPA Region III Risk-Based Concentration for arsenic in industrial soils based on a target risk of 10^{-5}.

[b] The GISL for cadmium is based on the value for food.

[c] The GISL and SSL for chromium are based on the values for hexavalent chromium.

[d] A screening level of 400 mg/kg has been set for lead based on the *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (USEPA, 1994).

I - Estimated concentration due to severe matrix interferences. During analysis, using ICP, serial dilution failed to meet established control limits of 0-10%.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NA - Not available

Shading indicates concentration exceeds both Site Background and the generic industrial screening level.

Bold text indicates concentration exceeds both Site Background and the migration to groundwater SSL.

Table 6-6
Summary of Organic Constituents
Area 3 - Former Potliner Management Areas

PARAMETER (mg/kg)	GENERIC INDUSTRIAL SCREENING LEVEL [1]	MIGRATION TO GROUNDWATER [2]	LOCATION/DEPTH/SAMPLE DATE					
			SB-311 3 - 5' 12/3/95	SB-313 3 - 5' 12/2/95	SB-315 3 - 5' 12/2/95	SB-315 (DUP-328) 3 - 5' 12/2/95	SB-316 3 - 5' 12/3/95	SB-318 3 - 5' 12/3/95
VOLATILE ORGANICS								
Acetone	20,000	16	1.1 DBj	<0.026 Bu	<0.010	<0.014	<0.004	<0.004
SEMIVOLATILE ORGANICS								
Naphthalene	4,100	84	<0.39	0.071 J	<0.38	NA	<0.37	<0.36
2-Methylnaphthalene	4,100	3.6 [a]	<0.39	0.08 J	<0.38	NA	<0.37	<0.36
Phenanthrene	61,000 [b]	1,012 [a,b]	<0.39	0.23 J	<0.38	NA	0.21 J	0.049 J
Anthracene	61,000	12,000	<0.39	0.071 J	<0.38	NA	0.053 J	<0.36
Fluoranthene	8,200	4,300	<0.39	0.39 J	<0.38	NA	0.45	0.11 J
Pyrene	6,100	4,200	<0.39	0.34 J	<0.38	NA	0.4	0.093 J
Benzo(a)anthracene	7.8	2	<0.39	0.25 J	<0.38	NA	0.28 J	0.066 J
Chrysene	780	160	<0.39	0.26 J	<0.38	NA	0.33 J	0.071 J
bis(2-Ethylhexyl)phthalate	410	3,600	0.062 J	0.13 J	0.069 J	NA	0.067 J	0.045 J
Benzo(b)fluoranthene	7.8	5	<0.39	0.28 J	<0.38	NA	0.35 J	0.058 J
Benzo(k)fluoranthene	78	49	<0.39	0.23 J	<0.38	NA	0.26 J	0.063 J
Benzo(a)pyrene	0.78	8	<0.39	0.26 J	<0.38	NA	0.33 J	0.064 J
Indeno(1,2,3-cd)pyrene	7.8	14	<0.39	0.18 J	<0.38	NA	0.24 J	0.04 J
Dibenz(a,h)anthracene	0.78	2	<0.39	<0.51	<0.38	NA	0.06 J	<0.36

[1] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-6}; Hazard Quotient = 0.1).

[2] USEPA Soil Screening Guidance - Technical Background Document (SSG-TBD), May 1996, DAF = 20.

[a] Calculated per SSG-TBD - Eqn. 22.

[b] Surrogate compounds (see Chpt. 3.2.2) used to develop screening levels.

B (organic) - Present in analytical method blank.

D, DL - Results from diluted sample.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

j - Concentration considered an estimate based on data validation.

u - Laboratory reported detection not validated during data validation process.

J - Estimated concentration, concentration is less than reporting limit.

NA - Not available

Shading indicates concentration exceeds the generic industrial screening level.

Bold text indicates concentration exceeds the migration to groundwater SSL.

Table 6-7
Summary of KACC RFI Soil Analyses[1] Performed in Area 3
Former Potliner Management Areas

SAMPLE NUMBER (depth in feet below grade)	DATE SAMPLED	TOTAL CYANIDE (mg/kg)
SPL-1 (20.0-30.0)	04/11/96	<0.53
SPL-1 (30.0-40.0)	04/11/96	<0.53
SPL-1 (40.0-50.0)	04/11/96	<0.54
SPL-1 (50.0-60.0)	04/11/96	<0.55
SPL-1 (60.0-62.0)	04/11/96	<0.53
SPL-1D (40.0-50.0)	04/11/96	<0.54
SPL-2 (20.0-30.0)	04/10/96	<0.53
SPL-2 (30.0-40.0)	04/10/96	<0.52
SPL-2 (40.0-50.0)	04/10/96	<0.52
SPL-2 (50.0-60.0)	04/10/96	<0.53
SPL-2 (60.0-67.0)	04/10/96	<0.54
SPL-2D (30.0-40.0)	04/10/96	<0.53
SPL-3 (20.0-30.0)	04/08/96	180
SPL-3 (30.0-40.0)	04/08/96	52
SPL-3 (40.0-50.0)	04/09/96	120
SPL-3 (50.0-60.0)	04/09/96	61
SPL-3 (60.0-62.0)	04/09/96	1.7
SPL-3D (40.0-50.0)	04/09/96	47

[1] Data obtained from KACC, 1997.

Table 6-8
Summary of KACC RFI Groundwater Analyses[1]
Performed in Area 3
Former Potliner Management Areas

PARAMETER[2]	Location/Position/Sample Date							
	SPL-1 DOWNGRADIENT				SPL-2 DOWNGRADIENT			
	May-96	August-96	September-96	August-97	May-96	August-96	September-96	August-97
Total Cyanide, Unfiltered	5.3	6.3	11	13	4.0	3.4	3.9	4.4
Total Cyanide, Filtered	NA	NA	15	NA	NA	NA	4.3	NA
Weak Acid Dissociable Cyanide, Unfiltered	0.14	0.3	0.2	0.12	0.11	0.14	0.17	0.07
Weak Acid Dissociable Cyanide, Filtered	NA	NA	0.25	NA	NA	NA	0.13	NA
Free Cyanide by Microdiffusion, Unfiltered	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Free Cyanide by Microdiffusion, Filtered	NA	NA	<0.02	NA	NA	NA	0.05	NA
Fluoride, Unfiltered	2.9	4.8	5.5	3.4	3.3	3.7	3.9	4.5
Fluoride, Filtered	NA	NA	4.7	NA	NA	NA	4.0	NA

PARAMETER[2]	Location/Position/Sample Date			
	SPL-3 UPGRADIENT			
	May-96	August-96	September-96	August-97
Total Cyanide, Unfiltered	7.9	6.2	9.5	2.9
Total Cyanide, Filtered	NA	NA	6.3	NA
Weak Acid Dissociable Cyanide, Unfiltered	0.09	0.29	0.21	0.05
Weak Acid Dissociable Cyanide, Filtered	NA	NA	0.24	NA
Free Cyanide by Microdiffusion, Unfiltered	<0.02	<0.02	<0.02	<0.02
Free Cyanide by Microdiffusion, Filtered	NA	NA	<0.02	NA
Fluoride, Unfiltered	3.8	4.4	4.1	3.0
Fluoride, Filtered	NA	NA	4.8	NA

[1] Data derived from KACC, 1997.

[2] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

NA - Not analyzed

Shading indicates concentration meets or exceeds the 0.2 mg/L groundwater standard.

Total cyanide was not detected in either soil sample collected for the Versar RFA outside Building 65 and Building 66. Aluminum, arsenic, barium, chromium, iron, lead, manganese, nickel, tin, and zinc were detected.

In 1981-82, D&M collected soil samples from three borings drilled around Buildings 65 and 66. The approximate locations of the D&M borings, designated S11, S28, and S29, are illustrated on Figure 7-1. Soil samples were collected at the surface, at 1.5 feet below ground surface, and at 5-foot intervals to depths of 20 to 50 feet below ground surface. Soil samples collected by D&M were analyzed for leachable cyanide using the methodology described in Subsection 4.1. Table 7-2 summarizes the results of the D&M soil investigation conducted at Building 65 and Building 66. Leachable cyanide concentrations ranged from not detected to 2.5 mg/kg and were located at depths of 10 feet or less.

7.2 RFI Sampling Program

Two soil borings, designated SB-401 and SB-402 on Figure 7-1, were drilled at the Potliner Breakout and Accumulation Buildings. The soil sampling program and field screening results are summarized in Appendix J. Boring SB-401 was located in a shallow drainage swale east of Building 65. Boring SB-402 was located near the northwest corner of Building 65 where gray dust was observed on the ground surface. Soil samples were collected at the surface and at 3 feet to 5 feet below grade. Soil samples collected from borings SB-401 and SB-402 were analyzed for total cyanide. The results of the total cyanide analyses are presented on Table 7-3. Laboratory reports are included in Appendix I.

7.3 Discussion of Analytical Results

Total cyanide was detected in the surface soil samples collected from both borings and in the 3-foot to 5-foot sample from boring SB-401. Total cyanide concentrations ranged from 1.0 mg/kg to 3.2 mg/kg. Cyanide was not detected in the 3-foot to 5-foot sample collected from boring SB-402. Detected total cyanide concentrations were below the generic industrial screening level for cyanide.

7.4 Findings and Conclusions for Area 4

- Total cyanide was not detected in soil samples collected from Area 4 at concentrations above its generic industrial screening level.
- A human health risk assessment is not warranted for Area 4.
- No further investigation is warranted for Area 4.
- No further action is necessary in Area 4.

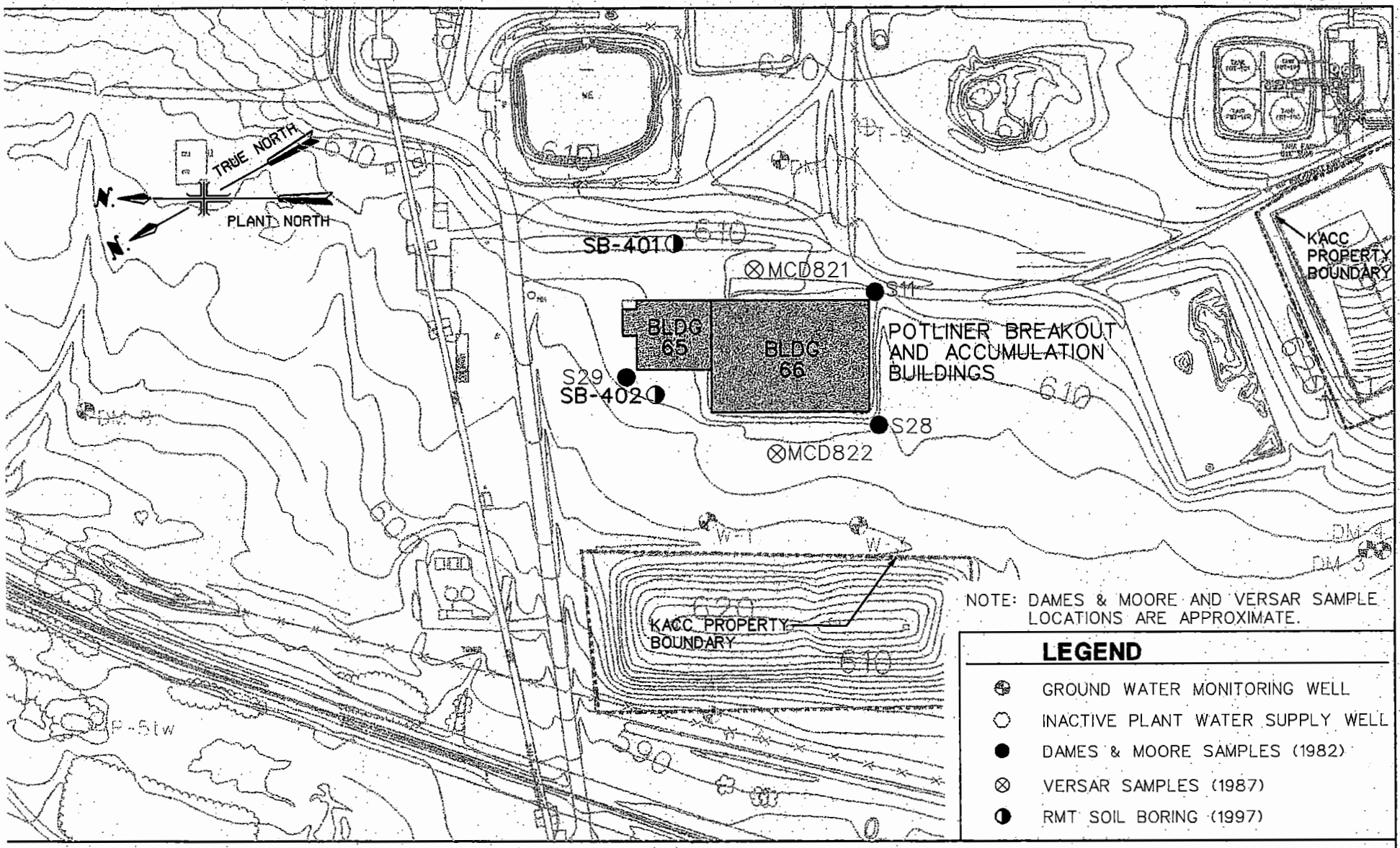


FIGURE 7-1

SOIL SAMPLING LOCATIONS
AREA 4
POTLINER BREAKOUT AND
ACCUMULATION BUILDINGS

CENTURY ALUMINUM
OF WEST VIRGINIA
RAVENSWOOD, WV

RMT 70410.73
1299

sr3/hydro/70410h/7040126/rfiarea4.dgn

Table 7-1
Summary of Versar RFA Soil Investion[a]
Potliner Breakout and Accumulation Buildings

PARAMETER[c]	SAMPLE DESIGNATION	
	MCD821	MCD822
INORGANICS		
Aluminum	4570	NA
Arsenic	6.4	NA
Barium	41[d]	NA
Cadmium	ND	NA
Chromium	9.6[b]	NA
Copper	ND	NA
Iron	8320	NA
Lead	8	NA
Manganese	446	NA
Mercury	ND	NA
Nickel	26	NA
Tin	21[d]	NA
Zinc	48[b]	NA
Cyanide	ND	ND

[a]Data derived from Versar, 1988.

[b]Not detected significantly above the level reported in laboratory or field blanks. (Versar, 1988)

[c]Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted.

[d]Value is greater than the instrument detection limit but less than the contract required detection limit under CLP. (Versar, 1988)

NA - Not analyzed.

ND - Not detected above contract required detection limits. (Versar, 1988)

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Table 7-2
Summary of Dames Moore Soil Investigation Conducted at the Potliner Breakout and Accumulation Buildings[b]

DEPTH (feet below grade)	CYANIDE[a]		
	LOCATION		
	S11	S28	S29
0	1.9	0.12	2.5
1.5	0.2	0.083	<0.02
5	0.035	<0.02	<0.02
10	0.023	<0.02	<0.02
15	<0.02	<0.02	<0.02
20	<0.02	<0.02	<0.02
25	NA	<0.02	NA
30	NA	<0.02	NA
35	NA	<0.02	NA
40	NA	<0.02	NA
45	NA	<0.02	NA
50	NA	<0.02	NA

[a] Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted

[b] Data derived from Dames & Moore, 1982.

NA - Not analyzed.

< - Less than.

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Table 7-3
Summary of Total Cyanide [1]
Area 4 - Potliner Accumulation and Breakout Buildings

GENERIC INDUSTRIAL SCREENING LEVEL [2]	DEPTH (feet)	LOCATION/SAMPLE DATE		
		SB-401	SB-402	SB-402 (DUP-421)
41,000 [a]	0 - 0.5	3.2	1.8	2.6
	3 - 5	1.0	<0.60	NS

[1] Analytical results are reported in milligrams per kilogram (mg/kg) *total* cyanide.

[2] USEPA Region III Risk-Based Concentration for Industrial Soils dated October 1, 1998 (Risk Target = 10^{-5}; Hazard Quotient = 0.1).

[a] The GISL for cyanide is based on the value for potassium silver cyanide.

< - Concentration less than the Quantitation Limit or not validated if accompanied by "u" qualifier.

NS - Not sampled.

Shading indicates concentration exceeds the generic industrial screening level.